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A Pull All Together.

THE impressive statements that have lately been issued officially on behalf of organised British electrical manufacturers, showing how co-operative measures have improved the position of the industry without adversely affecting the interests of the consumer, can be used to fulfil several important purposes.

One of such ends should be the lessening of hostility in the Home market by those who, acting as purchasers on behalf of the rate-paying public, consider that they are doing the right thing for their employers by declining to place business with manufacturers acting in co-operation, and who believe that they are doing the best thing nationally by placing contracts abroad and in that way administering a "lesson" to our firms. Another purpose of this official information is its education of the Empire and the world at large concerning the ability, capacity and efficiency of British electrical manufacturing.

The most recent document refers to the great development that has taken place in our electrical export trade in recent years "through an active sales policy in overseas markets." It shows, too, that instead of the unrestricted competition of former days, we now have the whole industry "moving forward on a scientific and sound economic principle," and that it "is contributing to the preservation of the highest British standards of workmanship in the markets of the world."

We are hearing so much from statesmen and other public speakers regarding the need for us to improve our methods of marketing and salesmanship that it is more than encouraging to have official assurances that in the electrical section of British industry

these criticisms apply less directly than they do to some others. Yet it would be wrong to shut our ears to criticisms that reach us from time to time from the overseas markets regarding some shortcomings and charges of apathy. Such complaints, so far as we ourselves are concerned, have been far less frequent latterly than they used to be, and the export trade figures show that we are to-day securing a good proportion of the world electrical trade that is going, but we shall be most unwise if this position of affairs lulls us into a state of satisfaction when some of our important works still have a large unoccupied capacity, when other countries are putting a keener edge upon their export trade weapons, and when new and large trade-producing developments are afoot which call for alertness.

We, with others, have condemned the disposition of some amongst us to emphasise too much the things that British manufacturers cannot do. Without hiding our heads in the sands, or shutting our eyes and ears to the obvious, we can afford to let the world know more concerning those excellent things that we can do and every day are doing. An industry which does not mind the impression getting abroad that it is down and out will find buyers very ready to believe it whether our own people or our foreign competitors are responsible for the circulation of such impression. British electrical industry far from being down and out, was never in a stronger position to give efficient service and high quality of product than it is to-day, but it is useless for us to take this knowledge to our hearts and nurse it for our own consolation. We have got to make it known—make the world ring with it so that it will reach every corner of the globe where there is a potential purchaser of electrical products.

We have endeavoured to do a substantial part in such connection through the editorial pages of the ELECTRICAL REVIEW, and it remains for manufacturers, through their individual effective publicity in our advertising pages, more amply to bring their detailed activities and products before both the home and the overseas readers.

It will not be amiss if we repeat now our regret at the indisposition on the part of some British electrical manufacturers to impart to such journals as the REVIEW descriptive and illustrated information regarding outstanding examples of work that they have done. If we were so minded we could fill these pages with articles based upon material forthcoming from German, Swiss, American, and other foreign sources, but save in about half-a-dozen well-known cases British manufacturers have never yet got into a decent stride in this matter. And all the time they have got a good story to tell. The reader welcomes really up-to-date information concerning what his industry is doing, but unfortunately too many firms fail to rise above the level of what newspaper men call a "puff," whereas with a little well-informed and well-directed effort they might vouchsafe facts, figures, and pictures which would be of great value at home and abroad.

After all that we can say regarding the advantages that are bound to accrue from co-operative policy among manufacturers, that co-operative policy can only reach the highest peak of efficiency when the individual unit is making its maximum effort. There must necessarily be a line drawn where co-operation ends, and individual enterprise becomes a separate powerful force. And for those who do not find that co-operation is a policy that attracts them, this individual enterprise must be moving all the time in order that they may not be left behind in the race.

It is satisfactory to have it authoritatively told that our industry is in a stronger position than ever before, but that is only the beginning of the story. To create the good impression is the first essential—but only the first. Each has to follow it up with particulars of his own sectional product in that industry and with evidence of his own individual ability to meet the purchasers' needs and tastes. The business which has a good thing to sell yet shuns publicity and shrinks from making adequate advertising allotments, may find that reticence and excessive precaution make all the difference between small and large scale production and all that this means in competitive marketing.

Proposed Overhead-Lines Association.

THE proposal which was originally set forth in the ELECTRICAL REVIEW of August 19th by Mr. R. Borlase Matthews was to secure a public record of all the men in this country with actual experience in overhead-line construction, so that they could communicate with each other for mutual assistance, and other parties would know where to turn for authoritative opinions on the subject. That object was to be attained by enrolling them in an informal "club," without subscription, and without holding meetings. But from the letters that we have received it appears that there is a distinct demand for something more—a corporate body representing this branch of engineering, and constituting a "school of thought" which knows what is required, and, secure in that knowledge, is determined to obtain what it wants; a body which can hold meetings for the discussion of technical and other problems, and can circulate information; a body which can take collective action on occasion.

The questions that obviously would be dealt with by such a body would be those relating to the regulations of the Commissioners and the Post Office; to delays in administration; to wayleaves (negotiations and rentals); to Special Orders (procedure and cost of obtaining them); to official returns and forms; to legal processes and difficulties—but inevitably other matters would crop up which could be most effectively handled by an organised society.

It is suggested, with the approval of Mr. Matthews, that a more appropriate title for the society would be "The Overhead-Lines Association" or some similar designation, and that its fundamental purpose would be to *cheapen the supply of electricity in rural areas.* Unless the greatest care is taken now, an excessive capital outlay will be incurred during the next ten years which will prove to be a veritable millstone round the neck of the industry for a generation to come. The national importance of carrying the supply of electricity into the country is generally recognised; equally well known is the difficulty of attaining that end under existing conditions, and the necessity of effecting a radical change in those conditions before the main purpose can be achieved. It would be the aim of the Association to hasten the removal of the restrictions and obstacles which at present hamper progress, and to do so not by opposing any existing organisation, but on the contrary, by the heartiest and most energetic co-operation with those who are working with the same objects in view. The Hon. Secretary of the I.M.E.A., Mr. A. C. Cramb, last week raised the question in our "Correspondence" columns whether it is desirable to start any new society. In this issue Mr. W. Fennell sets forth the case in favour of that course, and we may point out that Mr. Cramb himself is the president of a body (the Institution of Public Lighting Engineers) which is only four years old, the existence of which he recently justified, in his presidential address, on the ground that there was work for it to do. That is precisely the basis of the present movement.

It has been proposed that a general meeting shall be called, open to all who are interested in questions relating to overhead lines, to decide whether a society shall be formed, and if so, to set up an organising committee. We now have pleasure in announcing that this meeting will take place at 5 p.m., on Wednesday, October 12th, at the Institution of Electrical Engineers, London. All inquiries with regard to it should be addressed to the Editors of the ELECTRICAL REVIEW, 4, Ludgate Hill, E.C.4, the envelopes being marked "Overhead Lines Association."

Village Electrification.

A miniature installation in North Scotland where Diesel plant generates d.c. for the village of Lairg, and a.c. is transmitted to the outlying districts at 3,300 V.

AWAY in the highlands of Scotland, in the village of Lairg, Sutherlandshire, 650 miles from London, the inhabitants have the distinction, it is claimed, of being the most up-to-date in that part of the country, and probably the most northerly people to possess the advantages of electric lighting and power, as the result of the progressive policy of the owner of the estate, covering about 33,000 acres.

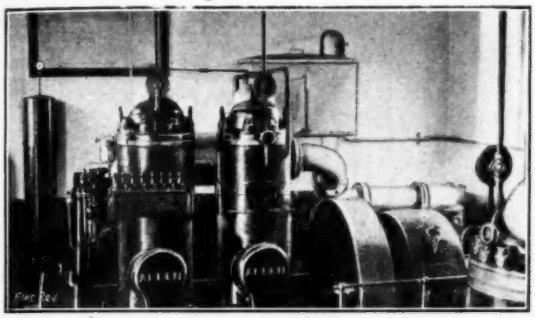


Fig. 1.—One of the Generating Sets.

Mr. Edgar Horne, who acquired the estate only a few years ago, soon decided that the inhabitants should participate in the progress of the times by the use of electricity. Owing to the low fall of the available water, and to preserve the excellent fishing there, a hydro-electric scheme was deemed out of the question, apart from the higher capital cost involved. A small power house was therefore erected mainly for the purpose of supplying electricity to the village and to Lairg Lodge, the owner's residence, about one mile away. The generating plant consists of two semi-Diesel sets, one 31-kW and one 43-kW, which are used for either running direct on the bus-bars or charging a Premier 600-Ah battery, the system of supply being d.c., 250 volts. Fig. 1 shows one of the oil sets. A switchboard equipped with generator, battery-charging, and feeder panels, forms part of the station equipment, and with the generating plant was supplied and erected by Messrs. W. H. Allen, Sons & Co., Ltd. The mains are run overhead on special creosoted red fir poles.

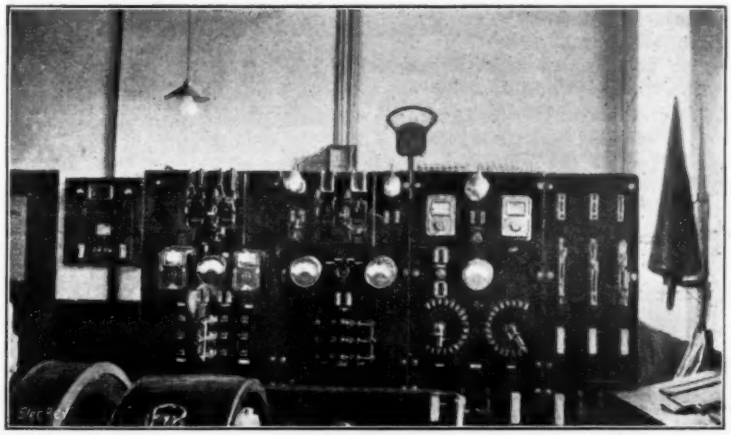


Fig. 2.—Main Switchboard.

Close to the power house are a saw mill and a laundry; the former contains a modern saw bench equipped with a 52-in. saw driven by a 32-b.h.p. motor. In the laundry the main shafting for driving the washers, rollers, and so on, is driven by a 12-h.p. motor, fig. 3, whilst collar moulders, shapers, and other small machines are driven by a small independent motor. Twelve electric irons of various weights are in continual use in the laundry. Following the installation of electrical equipment in the mill and laundry, crofters and small farmers in the district were not slow to appreciate the saving of labour by the use of electricity, and in response to various requests, Mr. Horne consented to electric mains being run round a district of five miles radius, which necessitated the change-over from direct to alternating current. A three-phase ring-main overhead line was therefore erected, to operate at 3,300 volts. Pole-type transformers have been adopted for feeding the outlying districts and houses, and in many cases, besides the houses being now lit by electricity, in the place of oil and candles, electric motors have replaced either hand labour or small paraffin engines for driving such machines as threshers, winnowers, and bruisers. The initial a.c. load is too small to warrant the installation of separate generating plant, so a motor alternator has been installed to run off either the busbars or the battery; to obviate unnecessary losses during the no-load periods, this machine is controlled by a time switch. Fig. 4 shows the a.c. plant, including the transformer for raising the pressure for distribution. Excellent results have already been obtained by the motor-driven threshers. In one particular instance 42 bushels of coarse oats were threshed in 1½ hours on a consumption of 4 kWh, at 3d. per unit. According to Mr. Murray,

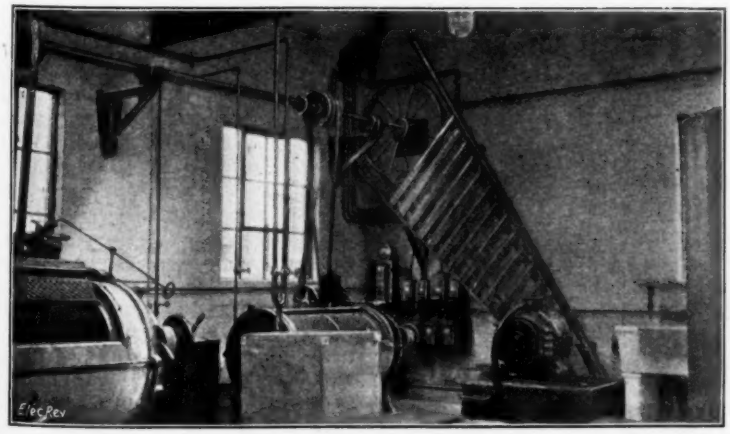


Fig. 3.—Electrically driven Laundry.

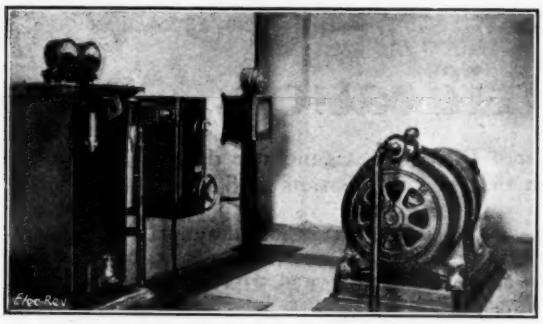


Fig. 4.—Motor-Alternator and Step-up Transformer.

of Drumnahaving, the farmer in question, it normally took 1½ days to carry out the same work by hand. The motors are of the squirrel-cage type.

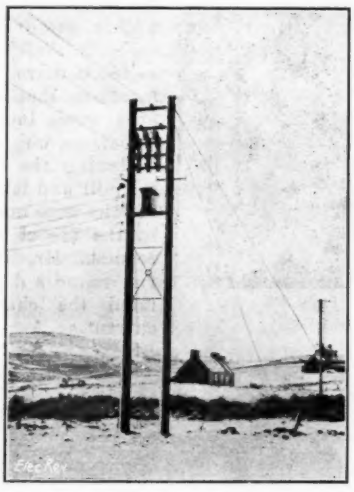
The h.p. line crosses some very undulating country, and, on account of the rough nature of the ground, a considerable amount of blasting had to be undertaken to obtain a sufficient depth for planting the creosoted fir poles; owing to this and to the fact that most of the work was done in the winter months, the contractor had no easy task.

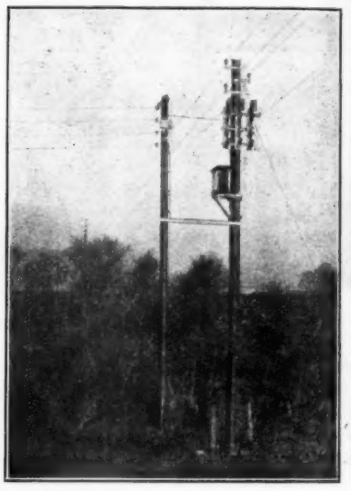
The ring main has been divided into three sections to enable any one portion to be fed either way by means of suitable switches and links. The McColl system of protection for the overhead lines has been adopted, and Trotter guards are fixed on the l.p. lines. Fig. 5 shows one of the transmission poles on the ring main equipped with a transformer and carrying both h.p. and l.p. lines. Where the transformer is carried on a single pole, fig. 6, the l.p. pole is braced to the h.p. one for additional support. The l.p. a.c. voltage is 400 V between phases and 230 between phase and neutral.

During the storm last December, when many trees in the district were blown down by the 100-m.p.h. gale, the whole of the lines and poles withstood this test very well, a testimony to the good workmanship of the contractor, Mr. Robert M. Russell, of Glasgow, who has been responsible to the consulting engineers for the whole of the overhead line and power installation work, and to whom we are indebted for the photographs here reproduced.

The transformers were supplied by the Foster Engineering Co., Ltd.

The consulting engineers responsible for the scheme were Mr. Claude Pain, M.Inst.C.E., and Messrs. A. Hugh Seabrook & Partners, on behalf of whom Mr. E. A. Uttley, M.I.E.E., a partner of this firm, supervised the work. We understand that Mr. Horne is applying for a Special Order.





Figs. 5 and 6.—Transformers on Poles.

The German Wireless Exhibition.

Growth in Output and Competition.

By A CORRESPONDENT.

THE fourth annual Berlin Wireless Exhibition, held from September 2nd to 11th, was noteworthy for the fact that the number of exhibitors was the largest since its inauguration, there being about 300 wireless manufacturers represented there. It was also noticeable for the efforts of the promoters to make the Kaiserdamm Wireless Exhibition Hall a popular resort for the public; for this purpose the grounds surrounding the hall and the wireless tower have been laid out in formal gardens with open-air cafés, which helps partly to explain the exceptionally heavy attendance for which this gathering is noted.

The exhibition offers a convenient opportunity for taking stock of the German position in wireless, from the points of view of both technical and commercial development. The German Post Office recognises the value of statistics both for the information they afford upon the present state of the industry and the guide they furnish for the future, and its subsidiary organisation dealing with wireless and broadcasting (the Reichsrundfunk-Gesellschaft) has an important statistical department under Dr. Antoine for the purpose of studying all factors relating to the development of broadcasting and wireless in general. On the occasion of the annual exhibition, several of the Post Office stands are devoted to a presentation of some of the most striking facts in the wireless position of interest to the trade and to the public.

As far as the home market is concerned, the German wireless trade appears to rest upon a sound foundation, as the demand is a large and steadily growing one, although it is in the main for cheaper material than in this country or in the United States. Since the date when the broadcasting service was started, wireless licences have grown at the following rates:—

January 1st, 1924	2,000
January 1st, 1925	548,749
January 1st, 1926	1,022.299
January 1st, 1927	1,376,564
July 1st, 1927	1,713,899

These figures are lower than the number of listeners in this country, but the German service was not instituted until nearly a couple of years after our own. Allowing for this lapse of time, the rate of growth has been practically identical in the two countries.

Turning to the export field, since the stabilisation of the currency permitted them to be recorded upon a comparative basis, German wireless exports have been:

1923	...	...	£324,555
1924	...	...	960,000
1925	...	...	1,478,300
1926	...	...	1,581,800 (approx.).

The greater portion of these exports is absorbed by European countries, and the position of the wireless trade in this respect is very similar to the older electrical industry. Great Britain is by far the largest customer for German wireless goods, and the following chart will show how our imports have compared with those from the United States during the past few years:—

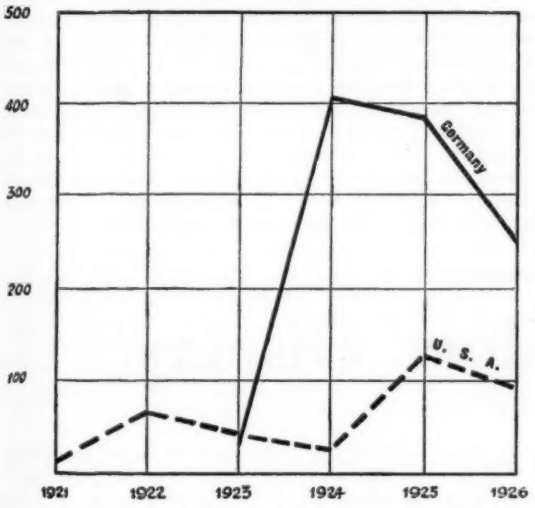
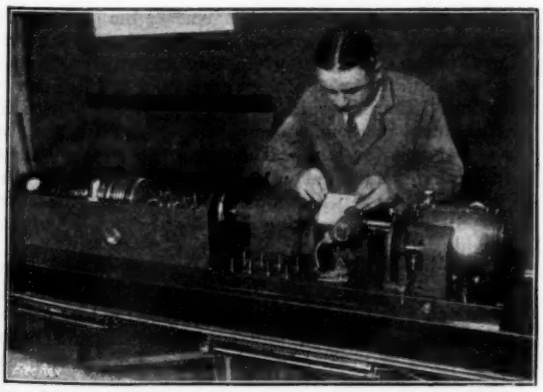


Fig. 1.—German and American Wireless Exports to Great Britain.

British trade with Germany in wireless is small, but growing. In 1925 it amounted to £15,754, and in 1926 to £23,539. The best-known English lines are Amplion and Brown loud-speakers, sundry English crystals, and the Ferranti transformer.

Exhibits.

The most interesting exhibit was undoubtedly the Telefunken-Karolus system of telephotography. Transmitting and receiving instruments were installed upon separate stands, and demonstrated daily by the Post



Presse-Photo G.m.b. H.] *[Berlin.*

Fig. 2.—The Telefunken-Karolus Transmitting Instrument.

Office. The system has come successfully through some very prolonged tests during the past year, and it has behind it a considerable body of influential technical support. The invention of Professor Karolus, of Leipzig, it has been developed by the Telefunken Company in collaboration with Siemens & Halske, and has now secured the backing of the postal authorities. The system is principally remarkable for its speed; recent tests between Berlin and Leipzig on a short wave of 850 metres have shown that an image of 10 × 10 cm. requires 20 seconds for transmission. Previous to this, the transmission of one square centimetre required 5 seconds, but it is expected that on shorter waves it will be possible to improve upon the Berlin-Leipzig tests.

It is the German view that the development of the

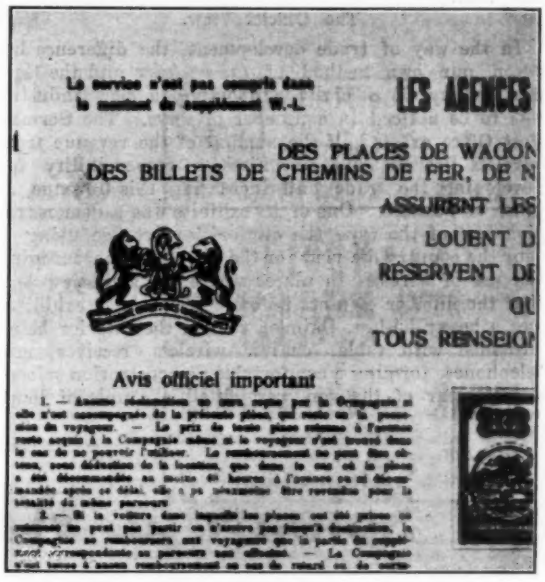


Fig. 3.—Specimen of Printed Matter Transmitted.

Karolus system will in the near future revolutionise all existing methods of communication with distant countries, as it is affirmed that the Morse system of coded messages must inevitably be superseded when it is possible for the actual reproduction of a document to be received over long distances at the speed which is the feature of the new system.

Amongst the commercial exhibits there have been no material alteration in the prices which have in previous years been quoted in these columns as typical of

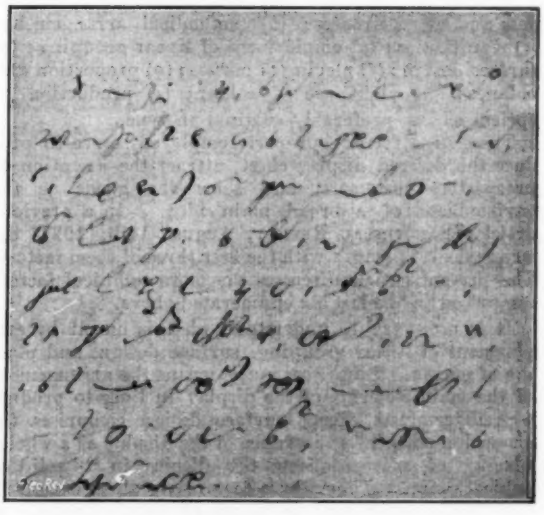


Fig. 4.—Specimen of Shorthand Script Transmitted.

the German trade, excepting that this year the loud-speaker trade has been the field of some intense competition owing to the considerable influx of new makers. The exhibits of battery eliminators of all kinds and sets taking power direct from the mains have grown considerably in number, and this feature of the trade, both in Germany and elsewhere, is causing anxiety to

manufacturers of h.t. batteries, whose exports to this country alone in primary batteries reach some £350,000 per annum. The number of multiple valves on the market has increased this year to four, indicating that this trend of valve development is regarded seriously in Germany, although the reason for it is undoubtedly more on account of the economies which can be effected in set construction than because of any improvement in reception.

The Official View.

In the way of trade development, the difference between our own method of *laissez-faire* and the German policy of officially supporting a new industry was to be noticed in a number of ways. The German Post Office exacts half the amount of the revenue from wireless licences, but recognises a responsibility for developing the trade and increasing this revenue as much as possible. One of its exhibits was a demonstration van of the type the authorities propose using to tour the country districts for the purpose of encouraging the use of wireless in places where the statistics show that the number of users is low. The vehicle exhibited was a heavy 55-h.p. Daimler saloon, the interior being provided with table, chairs, wireless receiver, and telephones, forming a comfortable demonstration saloon. At the rear of the van were fitted a couple of loud-speakers for the purpose of giving open-air demonstrations in the streets and squares of villages.

As a further instance of semi-official aid enjoyed by the wireless industry, it may be mentioned that many of the broadcasting stations advertise their programmes steadily and consistently throughout the year in the technical and general Press, particularly the company known as the Funk-Stunde A.G. operating the Berlin station. The broadcasting companies recognise that it is their business to advertise in order to increase the number of listeners in their areas, and as a consequence wireless manufacturers are left free to devote the whole of their efforts to an exposition of the advantages of the apparatus they have to offer.

The last year has witnessed a steady improvement in the workmanship of much of the wireless material exhibited, and the elimination of much inferior apparatus, but from all indications the importance of the exhibition is still mainly appreciated by importers and merchants. Forming as it does such a complete exposition of the state of an important competing industry, the Berlin Exhibition each autumn should also be visited in greater numbers by manufacturers, who by this means would gain a first-hand impression of the competition that is likely to be encountered, not only in the home market, but also in export fields.

Scientific Window Display.

By ERIC N. SIMONS.

WINDOW-DRESSING has been the subject of intensive research, and a number of exhaustive tests have been carried out, both in this country and the United States of America, for the purpose of discovering what may be called the scientific technique of display, *i.e.*, the principles and methods of arrangement best calculated to produce a satisfactory result. The electrical retailer should certainly familiarise himself with the results of these tests, which it is the purpose of this article to give him.

Briefly, there are nine primary factors in dressing a window successfully: they are (*a*) harmony, usefulness and attractiveness; (*b*) methodical arrangement; (*c*) significance; (*d*) employment of linear grouping; (*e*) surface design; (*f*) placing of masses; (*g*) proportion and balance; (*h*) right use of colour; (*i*) production of optical effects, preferably original in type.

These nine factors, properly employed, serve to produce the desired display effect, attract the attention of prospective customers, and show the goods as the environment of a broad main idea. In a previous article (ELECTRICAL REVIEW, August 14th, 1927) the writer dealt at length with the first three of these factors. The present article discusses the more technical factors comprised in the last six enumerated above.

It is necessary to understand what is meant by employment of linear grouping, surface design, and placing of masses. Linear grouping means the arrangement of the main elements of the display in lines to produce a predetermined effect; surface design comprises the general superficial appearance of the display as a whole; placing of masses affects the display in its solid or cubical sense. These three factors are all essentials in composition, and have to be considered as carefully as if they were needed in a drawing. Just as in an advertisement one has to introduce lines and surfaces artistically grouped, so in a window one has to attend to the elements of design, with the addition of the cubical factor.

To take linear grouping first, it is necessary to consider what effects have been discovered to result from certain arrangements. In a display purporting to give an impression of activity and movement, the liberal employment of slanting or diagonal lines is advantageous. Vertical lines, on the other hand, serve the purpose of sustaining an effect of power, strength, security. The straight vertical lines of a temple pillar serve as an example. Horizontal lines, again, produce an effect of calm, quiet, restfulness, the degree increasing in proportion to the definition and straightness of the lines. The line of the horizon at sea is probably the source of this sense of rest produced by horizontal lines. It must be remembered that many of these effects are psychological in character, and can be traced back to effects produced by natural objects.

If a sustained effect is required, it is important that the lines should not be too greatly broken, though attention can be drawn to a salient feature by the appropriate interruption of a straight line. The pleasing effect of a regularly waving line must also be taken into account.

Turning to superficial arrangement, the general outline of the display as a whole should be that of a curved figure, not a circle, but preferably an oval or elliptical figure. Square or circular arrangements are not so pleasing. There is said to be a suggestion of rigidity and coldness in them. They attract the attention, but do not grip it for long. The possibilities of rectangles and triangles must not be overlooked. The Greeks had a favourite figure which they called the golden section, being an oblong measuring three feet by five. This can be employed to great advantage.

The mass effect of a window display involves pretty much the same ideas. The Greeks had a "law of area," which stated five to seven to eleven to be the best possible proportion. Spherical and cubical arrangements are not so good as more unusual shapes, *e.g.*, pentagonal, triangular, conical, pyramidical masses.

Some attention must be paid to the background of the window, because it governs the general unity of the entire display. If the desire of the retailer is to show his goods, then he should make the background unobtrusive, yet of such a character that it harmonises with the articles shown. The main requisites of a good background are simplicity and ability to throw into prominence the goods shown against it. The retailer should bear in mind that the more commonplace and less intrinsically interesting the articles he displays, the more

decorative in style should his background be, and *vice versa*. The small dealer who has to make up his own backgrounds need not be deterred by this from designing really effective displays. He will obtain many good ideas from photographs and pictures in current fashion magazines and women's papers. It will be found a good plan to prepare a set of ready decorated panels and posts that can be slipped in and out of the window as desired. In this way, by providing a wide range of loose sections of background, variety and freshness can be achieved at no great cost.

It is always a good plan to make the backgrounds correspond with the seasons of their display. The background is practically the same as the drop-curtain of a theatre. It gives the requisite atmosphere of the piece, yet does not in any way distract attention from the actors before the footlights. Its colour is most important. If the goods shown are coloured, the background should be white or neutral. Grey, however, unless of a light shade, is apt to kill the colours shown against it. Black backgrounds are rather drastic, and need careful employment, owing to their deadening tendency. A good rule is always to make the background less intense in colour and shade than the goods shown against it.

One now comes to the question of colour as a factor in the display. The first point to be considered is the action of sunlight, which has a knack of upsetting all the elaborately planned harmonies of the display-window. There is no golden rule for guarding against the sun's rays and their disastrous effect on colour schemes. One useful suggestion is to use white or light backgrounds; but this, though it minimises, does not entirely eliminate the trouble. Another plan is to cover the underside of the awning with a dark green lining. There are plate-glass windows manufactured which are designed with a slight inner convexity, which does away with this harmful effect of sunlight. Unfortunately, their use is scarcely ever practicable, owing to their heavy cost, and to certain other disadvantages consequent upon their use.

Colour is the great factor in attracting the attention of the passer-by. It is necessary that the retailer should know a little about the effect of colour combinations. There are four principal methods of achieving proper harmony, namely, monochromatic, analogous, complementary, and triadic. Monochromatic methods employ varying shades of the same colour, *e.g.*, scarlet and carmine; the analogous method employs two colours next to one another in the solar spectrum, *e.g.*, blue and green; the complementary method uses colours exactly opposite to each other in what is known as the chromatic circle, *e.g.*, orange and Prussian blue; and, finally, the triadic method employs two analogous colours with an opposite colour, *e.g.*, yellow and green together with purple.

Each colour has three qualities—tint, depth, and value. The following rules will be found useful in arranging colour schemes:

(*a*) It is sound to contrast two colours, or two different shades of the same colour.

(*b*) Dark colours should be employed in a lower position than lighter ones, but never above them.

(*c*) It is inadvisable to use more than three distinct colours in one and the same display.

(*d*) Light colours should be employed in dark places, and *vice versa*.

(*e*) The more vivid the colouring of the shop itself (*i.e.*, its permanent colouring), the softer should be the colours used.

(*f*) Two different floral designs should never be set side by side.

Tapping E.H.P. Lines.

The author discusses the problem of obtaining cheap rural supplies from trunk mains, and describes a novel and inexpensive method of tapping extra-high-pressure lines.

By A. T. SCOTT, A.M.I.E.E.

RURAL supplies—supplies of electricity for the farmer, the agricultural worker, the small isolated village or hamlet—such supplies are being widely spoken of and written about. Additional load is being looked for by suppliers, hoped for by the manufacturers, and a cheap supply has been, if not definitely promised, at least implied in propaganda created by the new Electricity Act; as practically, if not quite, all industrial districts already have a supply of electricity, the rural areas alone have been left unprovided for.

The rural demands for power have been neglected, because the natural commercial development of extensive schemes cannot be governed by such incidental requirements. Rural districts or small villages are passed by main transmission lines as a village on the route of a main railway line is left without a station.

Main transmission lines are built to carry power to centres of load in much the same way as railways connect up important towns. Rural populations and industries are necessarily scattered comparatively uniformly over wide areas, and the demand for power can be most advantageously dealt with by branch lines fed from main trunk lines.

Why, then, it may be asked (and it has often been asked by landowners and farmers who are requested to give, and subsequently possibly required to provide, wayleaves for power lines) cannot rural demands for electricity be met? Certain suggestions recently advanced can be at once ruled out, amongst which may be included the prohibitive cost involved in complying with the Ministry of Transport's Regulations, the cost of G.P.O. crossings, and the cost of good British construction as compared with Continental practice. There may be a little benefit derived from a relaxation of Regulations, or by the adoption of a little Continental practice, but such benefits will not help very materially. The British type of country with its numerous roads, telegraph lines and railways, and the native resistance offered by individuals to their property being crossed by public works, have much more effect on the cost than any Regulation.

The expense involved by the tedious and unavoidable necessity of prospecting a route and obtaining wayleaves, and the delay that may be caused by an inquiry, or the cost of deviation, are much more important items, and these costs must be included in the cost of the line irrespective of whether it is to carry 10 kW or one million. Very possibly the 10-kW line charges per mile will be actually many times those of the heavier line.

Apart from the cost of the line, or the costs incidental to any particular line, there is the important question of the cost of obtaining the necessary local consents and Special Orders of authorisation to supply electricity for general purposes.

It is not unlikely that many landowners or farmers who have asked for a supply may be situated in an area for which there is no authorised distributor of electricity, even in spite of their being in, say, the area

of a power company whose power lines, capable of meeting all the needs of the local area, cross their lands.

The number of Special Orders granted recently by the Electricity Commissioners is significant. The cost of obtaining such Orders, and the tedious work of preparing the application, have been left over until these areas can be profitably dealt with for the purposes of a general supply.

Here, again, are two factors operating against a cheap rural supply—the cost and lengthy procedure involved in obtaining authority to supply, and the difficulty and cost of obtaining wayleaves. These costs can, it is true, be charged to overhead expenses, and their effect on the cost per mile of line can be minimised by the extensive development of rural supply schemes, but surely such development is retarded by the complicated procedure usually necessary to meet local demands. A small motor is required here and there, and for this a 3-phase supply is asked; a few street lights—these must be separately metered and switched, so that an additional wire is added for this purpose; a neutral wire is necessary, and this is in all probability duplicated for guarding purposes. Thus, a six-wire line is required, giving an arrangement on the line pole more complicated than a main transmission line and, after all, the maximum load may be only 20 kW.

If a cheap supply is required, why not simplify every part of the system? What is the objection to a single-phase supply with one conductor earthed? Single-phase motors are surely good enough up to 20 kW. The out-of-balance effect on the main 3-phase system can be made negligible by other similar additions along the main line. The voltage drop can be kept within reasonable limits by increasing the sectional area of the conductors (which are often on the small side) and by the more frequent tapping of the main overhead supply line.

Here, however, is a serious difficulty and the third factor operating against rural supplies. A small hamlet, together with several large farmers, was refused a supply from a 33-kV line which passed right over the area. Not only was the cost of tapping the line considered too great, but the tapping of a line for anything less than 500 kW was considered bad policy.

If it is bad policy to tap off a 33-kV line designed to carry 7,000/8,000 kW, what hope is there of the large rural population along the routes of the proposed 132-kV lines obtaining supplies by tappings from those lines, which may be carrying, say, 30,000/40,000 kW? To suggest such a thing is perhaps daring, even taking into account the fact that there are many small supplies being given at 33 kV from branches of branch lines (or, if preferred, from the twigs of a large 33-kV system). The trunk-line supply is too sacred to be endangered by relatively small 3-phase supplies.

The problem of providing suitable equipment whereby main transmission lines can be tapped for relatively small supplies is of vital importance. It is for supply engineers to state requirements, and for the manufacturer to provide the goods. The supply engineer's requirements are that the equipment must not endanger the main supply, and it must be possible to install it anywhere along the line without shutting down the supply, even temporarily. The whole of the apparatus must be easy to inspect, clean, and repair in perfect safety, and its cost must be low enough to make a cheap supply economically possible.

If the main supply is not to be endangered, the local apparatus must be so made and constructed that an internal fault is impossible, or so that any fault that can occur must be isolated before the fault current becomes serious. To achieve this end, several features may be suggested. The transformer may be constructed with a reasonably high self-impedance. A limiting resistance may be connected in circuit so that the possible fault current is limited to some definitely relatively small value.

The researches recently carried out in connection with e.h.p. fuses show that even if these are not yet available for 132-kV systems, they will before very long be available for them, and it is not unreasonable to hope that commercial articles with a really reliable breaking capacity up to 50,000 kVA will be obtained before very long.

An air-break switch will usually be desirable for breaking the magnetising current, but since this current is so small, it may often be broken by a suitably-designed combined switch and fuse.

So far, these suggestions have been confined to the use of accepted and widely adopted means, but the arrangement and mounting of the required apparatus call for very special attention. What form of arrangement would meet all the requirements? Take, for example, a difficult case:

An 80-kVA supply from a 132-kV line with horizontal spacing of conductors, pole spacing 750 ft., with suspension insulators. The supply is required at a point in the centre of the span, because wayleaves are only possible from this point, and easy and frequent access cannot be obtained elsewhere. The main 132-kV line cannot be shut down for connecting any apparatus thereto, and it is obviously impossible to erect a new pole or tower for the convenience of straining off the line to get a tapping point. Is this a proposition impossible to deal with? At any rate it takes account of most possible difficulties.

First, there is the difficulty of making contact with a swinging line. This, however, has been overcome for many years—ever since a trolley arm for a tramcar or train was used successfully. Such a device was successful from its inception, and has been and is used for obtaining temporary supplies for transformers from l.p. supplies. This at once provides the means whereby a connection can be satisfactorily made with any overhead line. It also provides a means for disconnecting apparatus, which can be situate at a safe distance away from the dangerous line.

Secondly, yet of primary importance, a breakdown on the local apparatus must not affect the main supply. Practically all e.h.p. breakdowns are due to failure of insulation or to external material causing a "short" between phases or between one phase and earth.

Insulators for the high voltages are the most costly part of the apparatus, so that if the number of insulators could be reduced, the cost of the apparatus would be reduced, and increased reliability obtained at the same time. It is interesting to note the number of possible fault paths to earth provided on the stereotyped design of small outdoor sub-stations usually employed for rural supplies.

All insulators are in parallel to earth. The breakdown of one is a fault on the system. It may possibly be caused by a crack, a straw, a branch of a tree, or a bird starting a flash-over. Each insulators placed between earth and line pressure is a weakness and an expense. One insulator between line and earth only, and that a good one, is the desideratum. This one insulator is required for insulating the end of the transformer winding from the frame, and in the present example is an 80-kV insulator or terminal bushing, say, something like 6 ft. 6 in. long, and capable of carrying a weight of 600 lb. or more when fixed in place. If, now, the trolley arm device be mounted on this insulator in a suitable manner, it is evident that the transformer can be connected to, or disconnected from, a main or trunk e.h.p. line where necessary, and when required, without the addition of any extra insulators to the equipment.

With such an arrangement, an external fault on the equipment is, for all practical purposes, impossible, but an internal fault in the transformer is possible, and must be guarded against. The fuse referred to before must be introduced, as also should the limiting resistance or choke which has been mentioned. These must be so mounted that their mountings do not offer additional leakage paths or possible breakdown paths to earth. Similarly, where a contact-making arm is not designed for, or is unsuitable for, breaking the mag-

netising current of a transformer, an air-break switch must also be provided.

This equipment might be carried on the insulated arm, and for this purpose the arm may be built up of insulators which are suitable for having the fuses, resistances or chokers, and the air-break switches attached to them. This arrangement provides all the essential features for a tapping arrangement such as can safely be used in connection with any e.h.p. line, however important.

There is only one insulator (the terminal of the transformer) which can, if broken or "shorted," cause a fault on the line, and such a fault is protected against by the fuses. All other insulators on the equipment are in series with this one, and a breakdown across any of the others would, at the worst, only put the local portion of the apparatus out of service.

Such a suggested arrangement is novel, and is the subject of an application for a patent.

Small connections from 132-kV lines, even of many times the size of that suggested above, are not practicable to-day, and entirely new types of gear are necessary to cope with small tappings from main lines. The insulation is the costly and vulnerable part, and the addition of insulators should provide increased safety instead of as at present being a weakness.

The International Electrotechnical Commission.

The Plenary Meeting at Bellagio, Italy.

(*Continued from page* 501.)

THE discussion on "Prime Movers" was wide in range, and held in a room that was fully occupied by representatives of all the countries taking part in the meeting.

The basis of discussion started with hydraulic turbines, subsequently turning to steam turbines; it is intended later to deal with internal-combustion reciprocating engines.

It was mainly with a view to formulating a skeleton specification—under the different heads—that attention was directed to determining the overall performances of the prime movers with their auxiliaries, the nature of tests contemplated, and the values of the physical constants involved.

The extent to which hydraulic turbines are used in Switzerland, Italy, Scandinavia, and America was made evident by the extreme care with which the delegates from those countries were able to put forward results of exhaustive tests on machinery, working under such varying conditions as to necessitate taking point by point sets of tables which had been worked out independently of what other countries found expedient.

The Committee was able to reach definite agreement on the essential elements of an international specification which has been accepted by the plenary meeting for issue as international (I.E.C.) rules for hydraulic turbines.

The discussions on steam turbines were equally full of interest; they dealt with the conditions under which acceptance tests should be carried out, the duration of preparation prior to and of the actual tests, the instruments to be employed, the variations of load during the time, facilities for stopping and restarting, permissible variations of speed with fluctuating load and with whole load thrown off, and special conditions applicable to parallel running with existing machines.

On many of these points it was found possible to indicate advantages that will be adopted with a view to bringing into line the many methods that were previously practised.

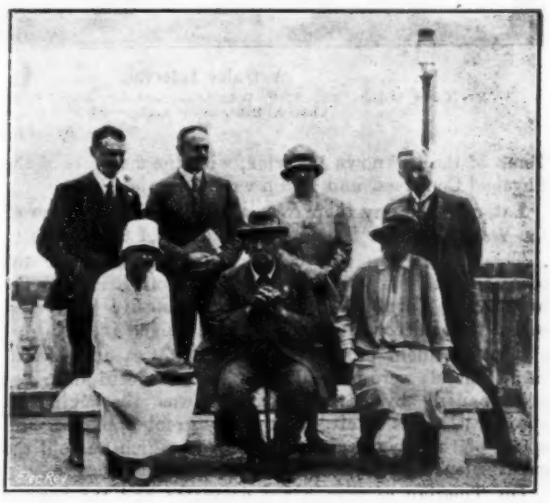
At the next meeting it should be possible to complete the basis of an international specification for steam turbines. In addition to this, it is intended to prepare a comprehensive questionnaire respecting heat engines following the excellent work done under the auspices of the Institution of Civil Engineers (Great Britain), the details of which were submitted by the British delegates.

It was pointed out that any agreement arrived at must not hinder development by inventive genius and constructive ability; the state of the industry, particularly concerning internal-combustion machines, needs a free hand where international exchange of views will in due course be valuable in avoiding the duplication of experimental research. Publication of results should be accurate as far as possible, and the results expressed in terms common to all countries.

A committee dealing with "Terminal Markings" had before it proposals made by several countries.

There was general agreement to use capital letters for the high-voltage side of transformers and small letters for the low-voltage side; indications of national as well as external connections frequently need to be made, and it is of importance that uniformity in this direction should be adopted as closely as possible.

Until the complications in connection with polyphase systems are discussed, it is not realised how difficult the problem becomes and what close study is needed in this apparently simple proposition to succeed in arriving at a universal notation that can be learned and will not lead to misunderstanding on the part of the purchaser or his agent.



An I.E.C. Group.

Mr. B. Pochobradsky, Mr. T. P. Wilmshurst, Mrs. Robinson, Mr. I. V. Robinson, Miss Crompton, Col. R. E. Crompton, and Mrs. Wilmshurst.—*By courtesy of* Mr. F. W. Purse.

This committee also discussed the settlement of the direction of rotation of machines, to afford a common basis for marking such machines. Clockwise rotation was generally accepted from the end of the machine opposite to that where the mechanical drive is located, and in the case of rotary convertors, the observer to face the commutator side of the machine. Owing to the

great difference in the practice and views of the different nations, great difficulty was experienced in finding common ground for standardisation.

A questionnaire covering the broad principles had been circulated by a sub-committee, and the replies to it were considered. A summary prepared by the Swiss delegate was taken in detail, and in places where a distinct majority in favour of any one of the principles appeared evident, it was determined to put such forward to the National Committees for consideration, with the hope that the dissentient nations would reconsider their views.

With regard to those cases in which there was no distinct majority view, it was decided to refer them to the sub-committee for further consideration, probably in Paris some time next year.

The delegates left Florence by the special train provided for their use by the Italian State Railways, about 4 p.m. on Sunday, September 18th, and reached Rome the same evening about 10.30.

On Monday, September 19th, they attended at the Tomb of the Unknown Warrior, with the members of the Physical Congress, and laid a wreath on the Tomb.

Later in the day there was a celebration in Rome of the Volta Centenary, held in the Palace of the Senate.

The Palace was gaily decorated with flags for the occasion, and the Square outside was conspicuous by the number of Carabinieri in their distinctive uniforms, whilst floral decorations had been arranged inside.

The President of the House of Deputies and several State officials were present. Senatore Marconi, who was accompanied by Mrs. Marconi, was the principal speaker; he was received with very great applause, and spoke of the reverence and esteem in which he held the great scientist whom they had met to commemorate.

On Tuesday afternoon the delegates had the honour of being invited to take tea with Signor Mussolini at his Villa in Rome. Each of the delegates was introduced to him, and he found time to partake of the exquisite tea which had been spread on tables in the garden of the Villa, with competent musicians to add to the very great pleasure of all those who were present.

It was a most agreeable function arranged by the Reception Committee in Rome, and affords conspicuous evidence of the trouble that they have been prepared to take, and have taken, in order to render memorable the all too short stay of the delegates in Rome.

A few of the delegates were also received in audience by the Pope.

A large party of the delegates whilst in Rome was given the opportunity of inspecting the works in progress for extending the useful effect of the Tivoli power plant.

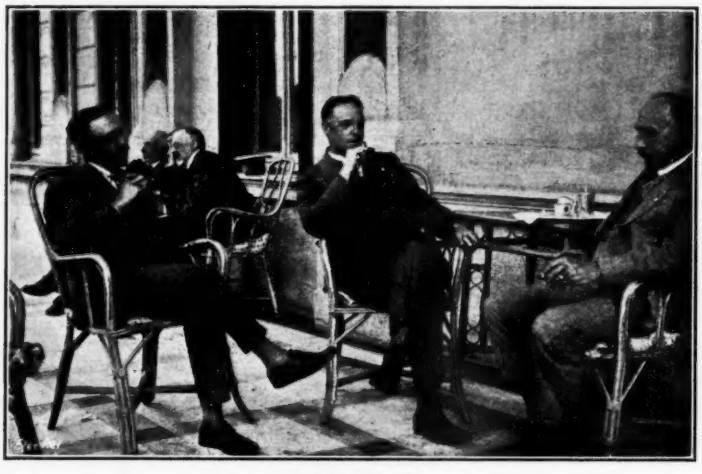
The falls along the River Aniene are looked upon as lending great beauty to the district, and the concession, therefore, has been granted on the lines that during the day time only a limited quantity of water may be diverted from the falls, and the sluice gates duly regulated for the purpose, whilst from dusk till daylight there is no restriction.

This arrangement can be fitted in with the other power plants supplying Rome and the district which will deal with the day load.

The head water is given as 786 ft. above sea level, and the tail race about 160 ft., affording an effective fall of 626 ft., which, however, will be used in stages on one of the lines of pipes.

The down-take is a tunnel about 3,600 ft. long, a portion of which is vertical, followed by a further length laid with a fall of 9.3 per cent., and the final length of about 300 ft. is practically horizontal.

The construction in the tunnel is partly reinforced concrete, and the lower end electrically welded steel pipes, to carry a normal flow of 330 cu. ft. per second.



A Quiet Interval.

Mr. C. le Maistre, Mr. T. P. Wilmshurst, and Mr. Roger T. Smith—Mr. Chas. A. Baker in the background.

At Villa Melzi.

Dr. W. H. Eccles, Mr. Ll. B. Atkinson, and Mrs. Eccles.

Photos by courtesy of Mr. F. W. Purse.

Two 16,000-kVA turbines are now installed, and a third will be added.

In order to afford additional storage of water, the dam round the head race is being increased in height by 8 ft. 6 in., and this work is now well in hand; it is expected that it will be completed early next year.

The following is a copy of a telegram which has been sent to Signor Mussolini:—

"His Excellency the Prime Minister,

"ROME.

"At the termination of a most delightful and all too short sojourn in Italy, the delegates of the I.E.C. thank the Government most sincerely for the many courtesies extended to them, particularly appreciating the honour your Excellency conferred on them by receiving them at your Villa Torlogni, which will remain for them the crowning feature of one of the most important meetings the Commission has ever held.

"(Signed) FELDMANN, President.
"LE MAISTRE, General Secretary."

(To be continued.)

The Institute of Wireless Technology.

The 1927-8 season will open on Tuesday, October 11th, when Mr. G. Leslie Morrow, F.R.S.A., will read a paper entitled: "The Design of a Resistance-Capacity Amplifier for Broadcast Reproduction," at the Engineers' Club, London, at 7 p.m. Those interested in this or other meetings of the Institute should communicate with the Hon. Secretary at 71, Kingsway, London, W.C.2.

The National Radio Exhibition.—I.

Some impressions of the show: a review of the trend of development in the design of modern apparatus, and features of the new exhibits.

THIS year's National Radio Exhibition staged by the Radio Manufacturers' Association at Olympia, London, surpasses all previous ones in both interest and quality. Of an all-British character, the display of complete sets and component parts reveals manufacturing enterprise and progress of no mean order.

Nearly 300 stands in the hall are occupied by some 187 exhibitors, of whom only about 19 are not manufacturers of radio equipment. The Exhibition will remain open for seven whole days only (September 24th to October 1st), instead of for thirteen days as last season.

Although not yet as cheap on the whole as the prices ruling at the recent German and American exhibitions, the prices of some British-made accessories, especially valves, have fallen considerably lately. The purchaser is now being offered far better value for his money, for the prices of complete valve receivers are materially lower than in previous years, the complication of operating valve sets has been greatly reduced, and quality of reproduction much improved; so that the contention that headphone crystal-set reproduction is superior to that obtainable from a loud-speaker valve set can no longer be maintained. The proportion of crystal receiving sets on view at Olympia is very small, compared with previous shows, which is significant. A feature of the show is the display of speakers in a variety of types, sizes, and shapes, many of them made to represent all manner of things. The horn loud-speaker is still with us; indeed, some users of small installations prefer it, but the cone and diaphragm patterns are much in evidence, whilst, when plenty of power is available, the moving-coil type is an instrument of merit.

Notwithstanding the high standard of excellence that manufacturers have set themselves during the past twelve months, finality seems to be as remote as it ever was: consequently, the Exhibition stimulates thought and reveals many opposing trends of design. For instance, while the capability of the super-heterodyne receiver, when designed as a frame-aerial self-contained or portable outfit, of producing extraordinary results with a poor input is apparently hard to beat, when an outside aerial is available a neutrodyne circuit is thought to be decidedly more economical, though it is said to be "hopeless" for ultra-short-wave work; so we find manufacturers trying to solve the problem by combining the two principles. Again, the struggle for supremacy in the low-frequency stages between the transformer, resistance-capacity unit, and choke is abating but little; each method of coupling can be very good, or very bad, depending on how it is used, and those who desire a clear conscience may employ r.c. for the first stage with a transformer in the second and a choked output circuit. The unsuitability of the earlier valves for the purpose caused r.c. coupling to be regarded as somewhat uneconomical, but since valves possessing a high magnification factor became available, the method has received considerable attention.

The variety of valves now marketed with different characteristics to suit every purpose widens the choice: the recently-introduced double-grid, or screened, valve, one of the outstanding novelties of the show, promises to be of particular utility on the high-frequency side and certainly extends the field for experiment.

The public's increasing appreciation of good-quality reproduction hastened the recognition of the need for comparatively high anode voltages; the indirectly-heated cathode valve has brought us a step nearer to "socket power" receivers, and we have had a crop of battery eliminators for operation directly off the domestic service mains. A really "silent background" and adequate output are, however, not easy of attainment at a popular price, and until consumers' voltages have been standardised and the task of "wiring *all* the homes of Britain" has been accomplished, accumulators and dry batteries will continue to be used; when chosen of adequate capacity they function satisfactorily.

Selectivity appears to need some improvement, if full advantage is to be gained from the promised regional broadcasting scheme and the available service of alternative programmes. Simplification of control has received its due share of attention: the modern variable condenser is a fine example of instrument making, and the logarithmic type permits of the dials of two circuits being synchronised so as to remain "in step" throughout almost its whole range. Screw terminals have been largely replaced by plug and jack switching. Valve-filament temperature being no longer so critical as formerly, rheostats, which were largely responsible for the array of knobs to be seen on the earlier panels, are now finding a more logical home inside the apparatus; as a means of finely controlling volume and sensitivity, they will be retained by those who know how to use them, but when limited adjustment only is needed, semi-fixed resistors inside the cabinet serve the purpose, and extreme simplicity is obtainable by the incorporation of a fixed resistor for each valve.

Apart from those noticed above, the most striking features of the majority of the exhibits are excellent finish, good workmanship, and tonal purity of speech and musical reproduction. It is to be hoped that the opportunity of selling entertainment will not be neglected this season; a more serious effort in merchandising on the part of manufacturer and trader alike would be timely.

Banquet and Ball.

The Radio Manufacturers' Association's annual dinner was held at the Hotel Victoria on September 22nd, the president, SIR WILLIAM BULL, M.P., being in the chair.

Following the loyal toast, "The Radio Industry, with Success to the Exhibition," was proposed by the EARL OF BIRKENHEAD, who recalled that in December, 1923, when he opened a transmitting station, some 250,000 people out of a population of 44 millions owned receiving sets; to-day 2,500,000 people listened to what was broadcast. Very nearly one household in three in England listened, whereas even in the United States, which so obviously defeated us in everything, only one household in seven possessed a receiving instrument. The transmitting agency in this country was, he believed, of remarkable efficiency, but the receiving elements were of varying efficiency; if their great industry was to realise and carry out adequately its opportunities, every one must concentrate on perfecting the technique of the receiving instrument.

SIR W. BULL, in responding, said their object was to improve British radio apparatus.

CAPT. IAN FRASER, C.B.E., M.P., toasted "The British Broadcasting Corporation," pointing out how much had been done since its inception; he hoped, however, that programmes would be enlivened before long by the introduction of controversial matter.

SIR JOHN REITH remarked, in the course of his reply, that their engineer-in-chief (who sailed for America on September 24th) had gone to the Washington Conference with a brief to see that all possible endeavours were made to protect the broadcast waveband from interference.

MR. W. H. GOODMAN (chairman of the R.M.A.) toasted "Our Guests," and CAPT. WILLIAM SPARKS concluded his reply by reading a message of greeting he had brought from the American Radio Manufacturers' Association.

SIR EDWARD M. ILIFFE, K.B.E., M.P., who also responded, suggested more co-operation between British manufacturers, which was such a feature of American manufacturers' activities.

MR. A. E. BOWYER-LOWE (vice-chairman of the R.M.A.) proposed the health of the chairman, who responded briefly.

During the evening the company was entertained with music and vocal selections, and after dinner a ball was held.

Care has been bestowed on the decoration and illumination of the New Hall at Olympia; Messrs. Brooks & White are responsible for the lighting scheme, and a new departure is the relaying of music from the R.A.F. bandstand to a large dance floor on the gallery by means of "public address" loud-speakers of several different types.

The B.B.C. Exhibit.

The amateur transmitter is not neglected, as the stand of the Radio Society of Great Britain shows, whilst the largest single exhibit is that of the British Broadcasting Corporation, including a large size model of the London control room, complete with its amplifiers, s.b. board, corrector desk, and checking receivers, and also several small size models of other B.B.C. equipment. One of the two complete transmitters shown is the "Q" type, designed by Marconi's Wireless Telegraph Co., Ltd. It is rated as a 6-kW transmitter with a Geneva rating (*i.e.*, power in the aerial) of 1 kW. The transmitter itself consists of four panels, the rectifier, drive, oscillator and modulator. A motor-alternator set, which is driven from the mains, supplies the main step-up transformer with single-phase power at 500 volts and a frequency of 300 cycles, which is stepped up by the transformer to about 10,000 V and passed on to the rectifier panel, where full-wave rectification takes place. By the aid of suitable smoothing circuits, a d.c. high-tension supply at 10,000 volts, free from ripple, is obtained, and this is distributed to the other panels. The rectifier valve filaments are heated by a suitable

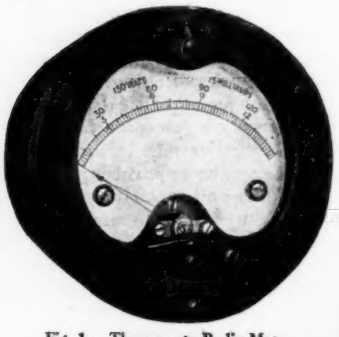


Fig. 1.—Three-range Radio Meter, Flush Pattern.

Fig. 2.—Projecting Pattern Radio Meter.

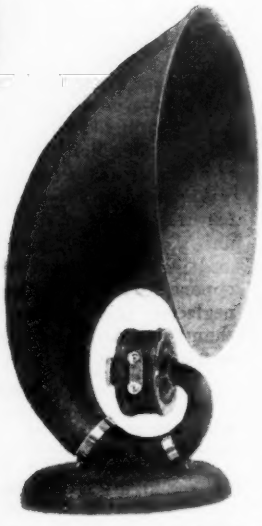


Fig. 3.—The Ferranti Loud-speaker.

transformer from the a.c. supply, but the other valve filaments obtain their current from a secondary battery, which is not exhibited; the modulation system is the ordinary choke control arrangement.

The other transmitter shown was manufactured by STANDARD TELEPHONES & CABLES, LTD., and has a Geneva rating of 5 kW. The circuit, however, is different from that of the Marconi set, as it employs high-frequency magnification; that is to say, choke modulation is carried out at low power and the modulated carrier wave is then amplified by successive stages of power amplification. The six units comprising the transmitter are the a.c. power unit, d.c. power unit, oscillator modulator unit, rectifier unit, power amplifier unit, and the tuning unit. The power supply for the oscillator-modulator unit is obtained direct from a 1,600-volt generator, while the 10,000-volt supply for the power amplifier unit is given by a three-phase half-wave rectifier; two separate generators supply filament current to the oscillator-modulator and power amplifier units.

Other Exhibits.

Whilst substantial progress has been made in almost every detail since last year, many new and improved models having been described in our pages recently, space considerations necessarily limit reference to individual items; a selection of new and representative types is referred to below:—

MESSRS. FERRANTI, LTD., whose output of audio-frequency transformers is 100,000 per annum, need no introduction to the radio industry. Their Hollinwood factory employs nearly 4,000 people, and about 12 months ago they started a new factory at Stalybridge, which is equipped with one of the finest laboratories devoted solely to radio work in this country; as a result of these developments, the following new components, amongst others, are being marketed. A range of moving-coil meters, comprising panel and portable instruments for measuring the voltage and plate current, &c., of radio sets. They are of high-class design and finish and have a guaranteed accuracy of 1 per cent., being provided with non-metallic cases so that the possibility of the accidental shorting of leads through their touching the instrument case is removed. The voltmeters are available in two kinds, having resistances of 200 ohms and 1,000 ohms per volt, and a valuable feature is the provision in all these instruments of a fuse beneath the small screw, visible in figs. 1 and 2 to the right of the zero adjustor, which is easily replaceable by the user from the front of the instrument without disturbing it in any way. The new AF.5 transformer has a normal inductance of 120/140 henries, and is approximately of the same dimensions as the Company's output transformers; when used with a valve having an impedance of 17,000 ohms and an amplification factor of 14.25, its amplification is 50 times over almost the whole of the musical scale, the amplification at 50 and 8,000 cycles being the same, namely, 46 times, which will give resistance-coupling enthusiasts food for thought. The Ferranti trickle charger, fig. 4, is a very simple piece of apparatus using a Westinghouse patent metal rectifier, no valve or chemicals. It is provided with four terminals suitable for charging 2-, 4-, or 6-volt accumulators at the rate of 0.5 ampere. The Company's first loud-speaker, fig. 3, will be available shortly, being provided with an exponential trumpet and having a resistance of 1,300 ohms; it has a very large and flexible diaphragm.

PELHAMS, LTD. The time control of wireless apparatus can be most useful; the clock part of the "Axuel" is set in the centre, and all around this are a number of small holes corresponding with the five-minute divisions of the twelve hours. A number of small pins are provided, and at whatever point a pin is inserted the clock will operate an internal switch and close the filament circuit of the set, which is joined in series with the two terminals, and at whatever subsequent point a pin is inserted the set is switched off. A full twelve-hour period of programmes can be mapped out with the pins and the set made to switch on and off just when required without a hand approaching it during that time. The switching is purely mechanical, and the pins themselves do not take a direct part in any electrical opera-

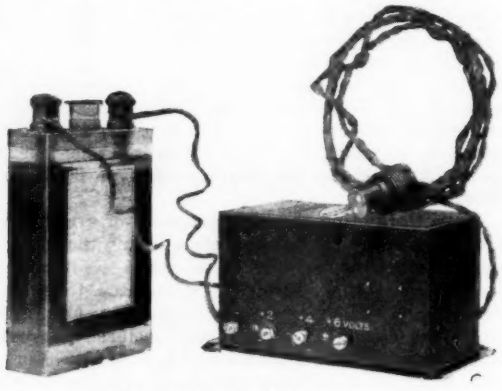


Fig. 4.—An L.P. Trickle Charger.

tion. A switch on the top of the device enables the set to be switched on during any off period without disturbing the day's arrangement of pins. The 30-hour clock movement appears to be a reliable one, and is supplied under guarantee.

SYDNEY S. BIRD & SONS' range of condensers includes the "Log. Mid-Line" pattern, fig. 5, the vanes of which are shaped midway between the square-law and straight-line frequency types so that the variation in capacity is intermediate, the effect being to avoid the crowding of stations

Fig. 5.—A Variable Log-Type of Condenser.

at either end of the scale. Another "Cyldon" new line is thumb-driven condensers, each controlled independently, several of which can be built into the set parallel to the panel so that only the edges of the dials protrude outside.

Business and Industrial Notes.

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations and Failures.

The E.D.A. Circle Campaign.

We have received from the British Electrical Development Association further information relating to the campaign inaugural luncheons which are to be held in many parts of the country on Monday next and on subsequent dates. In addition to the functions which were mentioned in our last issue others have been arranged by the following localities: Birmingham and Derby; Norwich; Ipswich; Portsmouth; Hendon; Halifax, Hebden Bridge, Brighouse and Elland. The Whitley Bay luncheon is being organised jointly by Tynemouth, Whitley Bay, Blyth, Ashington, and Morpeth. The chairman of the London luncheon, at the Hotel Cecil, is Mr. A. F. Harrison, and the principal speaker will be Sir James Devonshire, K.B.E. The Glasgow-Paisley luncheon is to be held at the Grosvenor Restaurant. Mr. E. Seddon will preside at the Edinburgh luncheon. The Lord Mayor of Cardiff (Ald. Wm. Grey, J.P.) is to preside at that city's function, with Mr. C. G. Morley New (city electrical engineer) as the principal speaker. The Belfast chairman will be Mr. C. M. Johnson, and the speaker Major S. H. Hall Thompson. At South Shields the chairman will be Councillor J. Ransome and the chief speaker Mr. J. Edgar (borough electrical engineer). Mr. W. H. Hyde will preside at the Hull luncheon, Mr. M. Watson at the Hampstead function, and Councillor R. Lemmon at the Greenock event, which is to be held at "The Lorne." Sir Harry Hatt, J.P., will be the chairman and chief speaker at Bath. Alderman W. Walker is to be the principal speaker at the luncheon at the Midland Hotel, Manchester.

Electrical Development at Glasgow.

An illustrated booklet addressed "To those who have recently installed electric lighting in their homes," is being issued by the Glasgow Corporation Electricity Department. This briefly describes all kinds of domestic appliances which may be hired or purchased from the Department, and gives particulars of consumption and charges. The latter are so reasonable (and the cost of energy in Glasgow is the same) that the booklet should persuade many lighting consumers to go further on the electrical road.

"Exceptional" Railway Rates.

The Traders' Co-ordinating Committee which presented the case for traders before the Railway Rates Tribunal has published a booklet dealing with the question of "exceptional" railway rates. Among other things, the publication instructs traders how to ensure a continuation of such exceptional rates as they have hitherto enjoyed; the method of measuring exceptional rates with standard charges; and the methods of dealing with low-class rates, &c. Copies of the booklet (one shilling, post free) can be obtained from the Committee at 39, St. James's Street, S.W.1.

Ferranti Radio Display.

An interesting display and demonstration of radio products made by Messrs. Ferranti, Ltd., was given at the Grand Hotel, Birmingham, recently by Messrs. Howard S. Cooke and Co., Birmingham, the sole Midland agents for Ferranti, Ltd., with Mr. R. Garside, of Ferranti's, in charge of the technical arrangements. The display included a complete range of the Ferranti transformers, A.F.3, A.F.4, the new A.F.5, O.P.1 and O.P.2, and the manufacturing processes of each of these were shown and demonstrated. The new Ferranti loud speaker was also shown. This is of somewhat unusual design. The speaker and the transformers were demonstrated on a receiving set constructed so as to permit of the substitution of other types of transformers for comparative purposes. The Ferranti permanent trickle charger for the home charging of accumulators was also shown. The demonstrations were continued for a week, and were attended by factors and traders of the Birmingham district.

Australian "Luxury" Imports.

According to a Sydney (N.S.W.) correspondent of *The Times Trade and Engineering Supplement*, there is a certain amount of perturbation in Australia regarding the quantities of "luxury" goods which are being imported. In a list drawn up by the N.S.W. Chamber of Manufactures there figure two items, wireless receiving sets and "valves for wireless telegraphy," the value of imports of which in the 1926-27 period is said to have been £331,421 and £165,245 respectively. Wireless telegraphy is not usually considered a luxury by broadcast listeners.

Local Exhibitions.

BRISTOL.—A private electrical exhibition was organised by Mr. F. W. Fifield, electrical engineer, at Elmdale House, from September 13th to 17th. The afternoon of the first day was reserved for trade visitors, but thereafter the exhibition was thrown open to the public. A wide variety of industrial and domestic equipment was displayed, and arrangements were made for the entertainment of visitors.

TUNBRIDGE WELLS.—An electrical exhibition, under the auspices of the Corporation Electricity Department, was to be formally inaugurated by the Mayor at the Pump Room on September 29th.

Electric Power in Industry.

Further trades are dealt with in Preliminary Report No. 23 on the 1924 Census of Production (*Board of Trade Journal*, September 22nd). It is shown that in the bleaching, dyeing, printing and finishing trades there was 50,250 kW of generating plant and 140,992 h.p. of electric motors, power for 65,186 h.p. of which was purchased. The lace trades reported 2,726 kW of generating plant and 5,966 h.p. of motors (power purchased for 3,959 h.p.). The generating plant in the jewellery, gold, silver, and electro-plate trades aggregated 738 kW, and there was 15,241 h.p. of electric motors (power purchased for 14,948 h.p.). The fish-curing trade had only 5 h.p. of generating plant and about 900 h.p. of motors.

Employment During August.

The September *Ministry of Labour Gazette* states that employment in the engineering industry during August remained slack on the whole, although it continued fairly good in electrical engineering. The proportion of unemployed in the engineering industry rose from 8.7 to 9.0 per cent.; in the electrical branch it remained at 4.9 per cent. The electrical wiring and contracting industry reported a fall in unemployment—from 8.0 to 7.3 per cent. There was also a decrease (from 6.6 to 6.1 per cent.) in the electric cable, wire and lamp manufacturing group. The actual numbers of unemployed on August 22nd were as follows: Engineering, 90,414; electrical engineering, 3,746; electrical wiring and contracting, 1,017; cable, wire, and lamp manufacture, 5,397.

Cape Town Electrical Exhibition.

An electrical exhibition promoted by the city electrical engineer and opened by the Mayor was held in the City Hall, Cape Town, at the end of August. Demonstrations of electric cooking and heating, hot water installations, vacuum cleaners, wireless, lighting, &c., were given by the principal electrical dealers and contractors. Mr. G. H. Swingler, the city electrical engineer, at the opening of the exhibition, gave a short history of the electrical industry in Cape Town.

Social Event.

Early this month the staff of Messrs. A. H. Hunt, Ltd., Croydon, held their fourth annual outing. At the invitation of the directors, a very pleasant day was spent at Brighton, the party travelling by char-a-banc. After lunch, on behalf of the staff, Mr. Howard, the cashier and book-keeper, who is the oldest employé of the company, presented a silver desk calendar to Mr. A. H. Hunt, and a pen to Mr. C. H. Hunt, both of which were suitably engraved. After tea the return journey was commenced, and a stop was made at Handcross, where an impromptu "sing-song" and dance took place.

An Important American Merger.

The New York correspondent of the *Financial Times* says that the Public Service Electric and Gas Company of New Jersey, a subsidiary of the Public Service Company of New Jersey, the Philadelphia Electric Company and the Pennsylvania Power and Light Company, have united, forming probably the world's largest electrical combination. The New Jersey Company serves nearly 3,000,000 people, or over 80 per cent. of the population of the State. Its system includes ten generating stations with an aggregate rated capacity of over 609,500 kVA. The Philadelphia Electric Co. owns or controls all power and light properties in Philadelphia and Chester, and in all the large towns in Delaware county. It serves over 2,000,000 people, having six stations of a capacity of 563,750 kW. The Pennsylvania Power Co. caters for a much smaller population, but a territory consisting of 409 communities. It possesses stations with a capacity of over 300,000 kW and important gas interests. The combined assets of the three concerns have a value of $700,000,000.

The Instalment System in Germany.

About two years ago several German electricity supply undertakings, including the Berlin municipal works, adopted the instalment plan of selling domestic electrical appliances, motors, &c. Since then the method has been extended on a large scale. According to replies to a questionnaire circulated by the German Association of Electricity Works, out of 152 responding works 100 had introduced the instalment system, and about half of these works carry on in conjunction with authorised contractors and dealers. Most of the works report favourable results, moderate or bad results applying mainly to agricultural districts. The extra charges for interest and risk are small in most cases, being generally from ½ to 1 per cent. per month, although some works do not make such extra charges, while others charge interest but make no addition for risk.

New Showrooms at South Shields.

Convenient and well-arranged showrooms and offices were opened recently at Albert Terrace, South Shields, by the Corporation Electricity Department (engineer: Mr. James Edgar).

New Showrooms at South Shields.

All kinds of domestic appliances, electro-medical apparatus for home treatment, &c., are on view, and, as will be seen from the accompanying illustration, the window has been dressed in a pleasing manner.

The Liverpool Commerce and Industry Exhibition.

At this exhibition, which opened on Friday last, there are several exhibits of electrical interest. For the lighting and power throughout the exhibition building, eight miles of electric cable is in use. It was manufactured by the Liverpool Electric Cable Co., Ltd., which, at its stand, shows many varieties of wires and cables. The wireless section includes a new form of screened coil for use with gang condensers. The Castle Fuse & Engineering Co., Ltd., exhibits fuses and distribution boards such as are employed by the largest power users in the North of England. On view is a massive cast-iron housing containing a double-pole assembly of 36 ways, controlling a total output of 1,300 A. A large signboard containing over 350 fuse units is also shown. Messrs. David Rowan and Co., general electricians to the Exhibition, have fitted on the fascia of their stand a small illuminated working sign, the automatic controller of which is situated beneath a glass panel in the counter. The J.D. Wireless Co. exhibits a full range of "Lissen" products and two- and three-valve sets. Another radio exhibit is that of Liverpool Radio Supplies, which comprises "Uniflex" products, "Mullard" valves, &c.

British Exports to the F.M.S.

The latest returns issued by the Customs authorities of the Federated Malay States show that during 1926 the following goods were imported from Great Britain: Telegraph and telephone materials, $322,128; insulated wires and cables, $173,843; "other electrical machinery," $117,133; and boiler and boiler house plant, $97,292.

Polish Foreign Electrical Trade.

The *Board of Trade Journal* reports that during July Poland imported "apparatus, conductors and other electrotechnical materials" to the value of 3,465,000 gold zloty and exported such goods to the value of 46,000 gold zloty.

New French Companies.

La Société Française Auxiliaire pour l'Electricité is the name of a company which has recently been formed in Paris (29, Rue de Rome), with a capital of ten million francs.

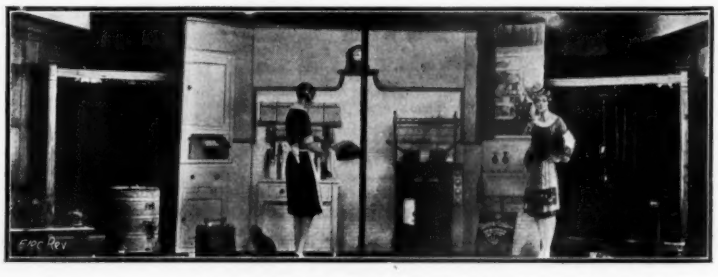
A company has been formed in Paris (49, Rue de Provence) with a capital of 1,250,000 fr. and the title La Société du Secteur Marocain d'Eclairage et de Force.

The Glasgow Housing Exhibition.

At the Housing and Health Exhibition opened in the Kelvin Hall, Glasgow, on September 21st, electricity occupies a prominent place. The Corporation Electricity Department has two stands, on which are exhibited electric fires and cookers for hire, water heaters, &c. The Clyde Valley Electrical Power Co. shows a fully equipped kitchen, bathroom, lounge, and fire room. The General Electric Co., Ltd., demonstrates electric cooking in a "Magnet" electric kitchen, and displays all kinds of domestic apparatus and lighting fittings. Other exhibitors include: The Electric Appliances Co., Ltd. ("Eureka" vacuum cleaners); Rogers Electric Sales Co. (artificial sunlight apparatus, suction cleaners, floor polisher, &c.); the Hurley Machine Co. (washing, ironing and wringing machines, &c.); Young, Osmond & Young, Ltd. (low-temperature tubular electric heaters); the Jackson Electric Stove Co., Ltd. (cooking and heating apparatus); James Meighan & Son (lighting and heating appliances, &c.); A. J. Smith (lighting fittings); Singer Sewing Machine Co.; Hoover, Ltd.; Frigidaire, Ltd. (refrigerators and "Delco" lighting plant); William Kemp & Co. (fires, cookers, &c.); the Falkirk Iron Co., Ltd. (cookers and electric fires); Tellus Electric Cleaner Co. (vacuum cleaners); Electrolux, Ltd. (suction cleaners); L. G. Hawkins & Co., Ltd. ("Universal" appliances); the Hotpoint Electric Appliance Co., Ltd. (washing and ironing machines, fires, cleaners, &c.); Alex Lindsay (lighting fittings, &c.); R. Wylie Hill & Co., Ltd. (lighting, labour-saving and cooking appliances); Logan Electric Supplies, Ltd. (clothes washer); the Quickfix Electrical Fittings Co., Ltd. (industrial lighting units, fires, violet ray and sun ray apparatus); the British Vacuum Cleaner and Engineering Co., Ltd.; Hailwood & Ackroyd, Ltd. (electrical and ships' fittings); and William Beardmore & Co., Ltd., in conjunction with the Celotex Co. of Great Britain, Ltd. (the "Celotexed" bungalow—lighting and heating all electric—fittings by the General Electric Co., Ltd.). The exhibition remains open until October 15th.

A Power Company's Window Display.

The Shropshire, Worcestershire and Staffordshire Electric Power Co., which is always active in promoting the increased use of electricity in its area, has designed a series of special window displays for its chain of showrooms. One of these is illustrated herewith and gives, as will be observed, a bright impression of an electric kitchen complete with all the latest appliances. The series covers all applications of electricity in the home.



A Shropshire, &c., Power Co. Display.

Illuminating Design Course.

The sixteenth illumination design course organised by the Electric Lamp Manufacturers' Association is to be held on Monday evenings during the autumn, commencing on October 10th. The subjects of the meetings (which are to be held at the London Lighting Service Bureau, Savoy Street, W.C.2.), are as follows: "Light Control"; "The Lumen Method of Designing Lighting Schemes"; "Lighting Shops and Stores"; "Theory and Characteristics of Electric Lamps"; "The Principles of Floodlighting"; "The Possibilities of Colour Lighting"; "The Art of Home Lighting"; "Special Lighting Problems"; "A Review of Lighting Practice at Home and Abroad." Applications for tickets of admission should be made to the Bureau forthwith. Design courses are being arranged for certain provincial centres.

New Catalogues and Lists.

SIEMENS ELECTRIC LAMPS & SUPPLIES, LTD., 38-39, Upper Thames Street, E.C.4.—Catalogue 167, containing illustrated data and prices of "Holophane" reflectors of numerous types.

WAGNER ELECTRIC SUPPLIES, LTD., 66, Victoria Street, S.W.1.—List No. 30, Sections II and III, dealing, respectively, with "R. & M." fractional h.p. motors and "Wagner" single-phase motors (¼ to 40 h.p.). Illustrated and priced.

MESSRS. WATSON & SONS (ELECTRO-MEDICAL), LTD., Sunic House, Parker Street, Kingsway, W.C.2.—An abridged illustrated price list of mercury-vapour and tungsten-arc lamps and other artificial sunlight apparatus.

POPE'S ELECTRIC LAMP CO., LTD., 5, Arthur Street, New Oxford Street, W.C.2.—Folder 4516, giving particulars and prices of "Elasta" gasfilled lamps.

SIDERMAN ELECTRICAL SUPPLIES, LTD., 4, Fitzroy Square, W.1.—October trade price list of electrical material and accessories.

THE CABLE ACCESSORIES CO., LTD., Tividale, Tipton, Staffs.—An illustrated list (No. 125) of "Revo" industrial reflector fittings fitted with a patent easy-wiring device. Priced.

MARCONI'S WIRELESS TELEGRAPH CO., LTD., Marconi House, Strand, W.C.2.—Pamphlet No. 239, containing a detailed description of the construction and operation of the company's radio equipment for whalers and trawlers.

THE IRON AND NICKEL BATTERY CO., LTD., 17-19, Cockspur Street, Pall Mall, S.W.1.—An illustrated and priced leaflet advertising the "Ionic" accumulator hand lamp.

METRO-VICK SUPPLIES, LTD., Trafford Park, Manchester.—A priced and well-illustrated booklet describing "Cosmos" "Shortpath" a.c. valves and battery eliminators. Also folders dealing with "A.N.P." astatic non-parasitic coils and the "Cosmos" five-valve receiving set.

MESSRS. S. G. BROWN, LTD., Western Avenue, North Acton, W.3.—The "Brown Budget" for September, dealing with various phases of the company's business.

"M.K." ELECTRIC, LTD., Wakefield Street, Edmonton, N.18.—A fully-illustrated and priced catalogue of the company's switches, plugs and sockets, &c., of many designs.

REDFERN'S RUBBER WORKS, LTD., Hyde, near Manchester.—A booklet describing the company's "Ebonart" panels, coil formers, knobs, &c., for radio work; and a pamphlet showing the Redfern pneumatic action valve holder. Both publications are priced.

MESSRS. CAMPBELL & ISHERWOOD, LTD., Raleigh Street Works, Bootle.—Two illustrated pamphlets: E.P.T.6, describing the company's portable electric coal drills; and E.P.T.7, dealing with a patent electrical grinding machine for Diesel engine valves.

THE RELAY AUTOMATIC TELEPHONE CO., LTD., Marconi House, Strand, W.C.2.—The "Relay Recorder" for September, advertising the company's automatic telephone system in an interesting and amusing manner.

THE MIDLAND ELECTRIC MFG. CO., LTD., Barford Street, Birmingham.—Catalogue No. 163, containing illustrated descriptions of the company's ironclad switch- and fuse-gear. Fully priced.

MESSRS. PETTER'S, LTD., Westland Works, Yeovil.—"Petter's Monthly News"—September, containing interesting illustrated articles and notes on the company's engines in various parts of the world. Special attention is given in this number to electric lighting.

MESSRS. FERRANTI, LTD., Hollinwood, Lancs.—Illustrated leaflets describing the company's audio-frequency transformers, radio meters, and loud speaker.

THE WANDSWORTH ELECTRICAL MFG. CO., LTD., Ludgate Hill, Birmingham.—A catalogue supplement containing particulars and prices of wall plugs and sockets and switch plugs.

THE ZURICH GENERAL ACCIDENT & LIABILITY INSURANCE CO., LTD., Fairfax House, Fulwood Place, High Holborn, W.C.1.—A booklet advertising the company's engineering plant insurance scheme.

HIGGS MOTORS, LTD., Witton, Birmingham.—September-October stock list of a.c. and d.c. motors.

THE CREDENDA CONDUITS CO., LTD., Oldbury, near Birmingham.—New season's catalogue of electric fires, well illustrated and fully priced. Particulars of kettles, irons, and other appliances are also given.

MESSRS. FALK, STADELMANN & CO., LTD., 83-93, Farringdon Road, E.C.1.—Catalogue No. 589, containing illustrations and prices of all kinds of glassware lighting fittings; a pamphlet illustrating examples of alabaster bowl fittings; and two pamphlets dealing with the company's electric fires.

THE GREENWICH CABLE WORKS, LTD., Crooms Hill, Greenwich, S.E.10.—A price list of "Pernax" cables of many types and sizes.

Trade Announcements.

Mr. J. L. LAKE, of 5, South Street, South Place, London, E.C.2, has been appointed sole agent for the Société Industrielle des Téléphones, of Paris, which has seven works for the production of cables, switchgear, &c.

THE BENJAMIN ELECTRIC, LTD., announces that its Yorkshire representative, Mr. H. L. Smith, will in future devote his activities to its business on the Continent. His duties in Yorkshire, Durham, and Northumberland will be taken over by Mr. F. W. G. Towers.

MR. G. W. BANKS, electrical engineer, 31, Bloomsbury Place, Brighton, has had to retire from business, as he has to enter hospital consequent upon disability contracted during the war.

MESSRS. MAYALL & CO., LTD., Birmingham, are removing their Nottingham branch on October 3rd to 13, George Street. The telephone number is unaltered: Nottingham 7296.

A sales conference was held by the MULLARD WIRELESS SERVICE CO., LTD., on September 17th, at the Holborn Restaurant, Mr. S. R. Mullard presiding.

Messrs. L. E. WILSON & CO., LTD., have removed to Hodson's Court, Corporation Street, Manchester. Telephone: "City 344." Telegrams: "Telephony."

MESSRS. BROWN & WILLIAMS, electrical engineers and lighting specialists, 43, Bath Place, Plymouth, will shortly open wireless and electrical engineering works at the rear of 179, Union Street, Plymouth.

The registered office of the MELBOURNE ELECTRIC SUPPLY CO., LTD., and of the ADELAIDE ELECTRIC SUPPLY CO., LTD., has been removed to 27-28, Finsbury Square, London, E.C.2. Telephone: "Clerkenwell 6136."

The address of Mr. H. H. LEGGE, London agent for Mersey Cable Works, Ltd., was yesterday altered to 33, Cannon Street, London, E.C.4. Telephone No.: "2588 Central."

Bankruptcy Proceedings.

H. FLETCHER, trading as the Western (Bolton) Lighting and Power Co., electrical engineer, 17a, Burlington Street, Bolton.—The public examination of this debtor was held on September 20th, at the Court House, Bolton. The deficiency was put down at £127. His failure was attributed to bad trade and sickness of family. Debtor commenced trading in partnership with his father-in-law, but the business proved unsuccessful, and in June of the following year the partnership was dissolved. Debtor continued the business, but without success. The examination was closed.

W. ROSS, 35, Bridge Street, Haverfordwest, Pembroke, wireless engineer.—The adjourned public examination of this debtor was held recently at the Shirehall, Haverfordwest. The statement of affairs showed gross liabilities of £317, of which £284 was expected to rank, against net assets of £51, leaving a deficiency of £232. The debtor commenced business on his own account in November, 1925, as a wireless and electrical engineer, with £30 capital. The examination was closed.

J. A. H. HALLIDAY, 38b, Worthington Street, City Road, Bradford, electrical engineer.—The public examination of this debtor was held on September 20th, at the County Court, Manor Row, Bradford. The deficiency was put down at £192. The examination was closed.

F. H. BARRELL (F. H. Barrell & Co.), electrical and radio engineer, &c., 2a, 2b, and 2c, Church Street, Staines.—Receiving order made September 15th, on debtor's own petition. First meeting October 4th, at 29, Russell Square, W.C. Public examination October 14th, at the Town Hall, Windsor.

L. BELL (C. Bell), mechanical and electrical engineer, Joseph Street, Leeds Road, Bradford.—Last day for proofs for dividend, September 30th. Trustee, Mr. J. Lund, City Chambers, 2, Darley Street, Bradford.

W. A. and F. G. H. BARKER (Barker Bros.), electrical engineers, 554a, Dudley Road, Wolverhampton.—Last day for proofs for dividend, October 5th. Trustee, Mr. S. W. Page, Official Receiver's office, 30, Lichfield Street, Wolverhampton.

H. PADGETT and A. NICHOLSON (Padgett & Co.), electrical and radio engineers, 218, Spring Bank, and 10, Beverley Road, Kingston-upon-Hull.—First and final dividend of 1s. 3½d. in the £, payable at the Official Receiver's office, 37, Scale Lane, Hull.

A. H. RICHARDSON (Radio Supplies), wireless manufacturer, 4, Rose Hill, Finedon, Northampton. First and final dividend of 1s. 5½d. in the £ payable at the Official Receiver's office, Northampton.

A. H. SMITH, electrical distributor, 3, Park Place, Cardiff.—Receiving order made September 20th, on a creditor's petition.

H. WILSON (deceased), electrical contractor, late of 56, Woodhall Avenue, Thornbury, Bradford.—Last day for proofs for dividend, October 7th. Trustee, Mr. J. O. Morris, Official Receiver, 12, Duke Street, Bradford.

F. V. LAMBERT (Lambert and Curley), electrical contractor, 27, Parrock Street, Gravesend.—First and final dividend of 3s. 2d. in the £, payable October 11th, at the offices of Messrs. Corfield & Cripwell, Balfour House, Finsbury Pavement, E.C.

Company Liquidations.

DUBILIER CONDENSER CO., LTD.—A meeting of members is called for October 25th, at Ducon Works, Victoria Road, North Acton, to hear an account of the winding up from the liquidator, Mr. F. W. Hollings.

MARCONI SCIENTIFIC INSTRUMENT CO., LTD.—A meeting of members is called for October 26th, at Marconi House, Strand, W.C., to hear an account of the winding up from the liquidator, Mr. C. R. Dormer.

HIGH SALVINGTON ELECTRIC SUPPLY CO., LTD.—A meeting of members is called for October 29th, at "Arcana," High Salvington, near Worthing, to hear an account of the winding up from the liquidator, Mr. R. Dixon.

PREMIER ELECTRIC WELDING CO. (CLYDE), LTD.—A meeting of members is called for October 28th, at 216, West George Street, Glasgow, to hear an account of the winding up from the liquidator, Mr. T. L. McLintock.

Private Arrangements.

E. AMOS and E. C. WRIGHT, trading as Amos & Wright, electrical and motor engineers, 32, Slater Street, Liverpool.—A meeting of creditors was held on September 19th, at the

offices of Mr. P. S. Booth, 2, Bixteth Street, Liverpool, when a statement of affairs was submitted which disclosed liabilities of £2,173, of which £1,833 was due to the trade and £340 to the bank. The net assets were £551, leaving a deficiency of £1,622. The debtors commenced in partnership in August, 1925, with £25 capital, provided by Wright. Their operations had been confined practically to four contracts, and they attributed their position to losses incurred on these. An offer was put forward of a composition of 5s. in the £, payable in four equal instalments, on November 1st, 1927, February 1st, 1928, June 1st, 1928, and October 1st, 1928. The last two instalments were to be guaranteed. It was decided to accept the offer, and the deed of assignment already executed in favour of Mr. Booth was confirmed. A committee of inspection was also appointed, consisting of representatives of Messrs. Beadle & Co., Ltd., and British Insulated Cables, Ltd. The following are creditors :—

	£		£
British Insulated Cables, Ltd.	571	Falk, Stadelmann & Co., Ltd.	34
Macintosh Cable Co., Ltd.	645	General Electric Co., Ltd.	39
Beadle, T., & Co., Ltd.	556	Eldridge & Morris ...	70
		Bankers	340

Dissolution of Partnership.

HAWKINS & SOFFE, electrical instrument makers, 56, Crogsland Road, Chalk Farm, N.W.—Mr. J. B. Hawkins and Mr. W. H. Soffe have dissolved partnership. Mr. Hawkins will attend to debts and continue the business under the same style.

Trade with Greece.

In a recent report upon conditions in Greece (published by the Stationery Office for the Department of Overseas Trade, 1s. 6d. net), Mr. Richard Turner, O.B.E., Commercial Secretary at the Athens Legation, conveys some hints on trading methods. He says that British products have a good name in Greece and, prices being equal or approximately so, would generally sell better than those of their competitors. Greater attention should be paid to the clerical side of business; complaints are constantly being made by representatives of British engineering houses of the paucity of the information, drawings, advertising material, &c., furnished by their principals. Certificates of origin are sometimes omitted from consignments, which results in delay and trouble. Careful and up-to-date inquiries should always be made regarding the standing of the persons with whom trade is being done. Personal contact with prospective buyers is of the greatest importance, but British travellers are few compared with Germans, Czecho-Slovakians, French and Italians. Some figures given in an appendix show that the value of the output of "industries for the production of electricity" rose from 140 million drachmae in 1925 to Dr.200 million in 1926. In the latter year the exchange varied from 310 to 455 drachmae to the pound sterling.

Dispute in the Contracting Industry.

At the time of our going to press no settlement had been reached in the dispute between the Bective Electrical Co., Ltd., and its employés, although negotiations have been proceeding between the Electrical Trades Union and the National Federated Electrical Association. Last week the London District Committee of the E.T.U. instructed its members to cease working overtime for "federated" firms.

Book Notices.

"The Trade Disputes and Trade Unions Act, 1927, Annotated." By Lewis B. Ferguson, barrister-at-law. With a foreword by Lord Askwith, K.C.B. (Pp. 99.) London: Butterworth & Co. (Publishers), Ltd. Price 5s. net.—In order to reach a thorough understanding of the 1927 Act and all that it implies it is necessary to be acquainted with the whole history of trade unionism during the last and present centuries. Consequently Mr. Lewis has had to cover an enormous amount of ground before he can commence to deal with the Act itself. This he does in a very succinct manner, but one is compelled to think that there has been a waste of energy somewhere, for the book by Mr. Arthur Henderson which we reviewed on September 16th traverses the same territory in much the same way. It must, however, be admitted that the present book deals with the Act itself in a more thorough manner, and that is where the two works diverge, for Mr. Henderson's covers more than the legal side of trade unionism. The work is undoubtedly useful, but, as Lord Askwith says in his foreword, "How can any employer or trade union leader, even with the aid of Mr. Ferguson, quickly study, in the existing maze of laws, what the new law is said to be?" Lord Askwith presses for the consolidation of the existing statutes, and with this we are inclined to agree, after reading Messrs. Ferguson and Henderson.

"Canada: Geology, Mines, and Metallurgical Industries."—Handbook prepared specially for the Second (Triennial) Empire Mining and Metallurgical Congress, 1927, containing in concise form information concerning the mining and metallurgical industries of Canada, and the natural resources upon which they based. Ottawa: Government Printing Bureau.

"Wonderful Models—The Romance of the World in Miniature and a Complete Encyclopædia of Modelcraft." Part I, pp. 64; illustrated. London: Percival Marshall & Co. Price 1s. net.

We have received from Sir Isaac Pitman & Sons, Ltd., Parts I of the following of their engineering degree series of text-books which they are publishing in weekly parts:—"Applied Thermodynamics," by Prof. W. Robinson, to be completed in 12 parts; "Strength of Materials," by F. V. Warnock, to be completed in 8 parts, and "Performance and Design of D.C. Machines," by A. E. Clayton, to be completed in 9 parts. The price is 1s. net each part. Parts II will be published on October 1st. In addition to the above, Messrs. Pitman are publishing "Hydraulics," by E. H. Lewitt (8 parts), "Electrical Technology," by H. Cotton (8 parts), "Theory of Structures," by H. W. Coultas (7 parts), and "Theory of Machines," by L. Toft and A. J. Kersey (8 parts).

"Hydraulics," by E. H. Lewitt. Third Edition. Pp. xii+372; figs. 163. London: Sir Isaac Pitman & Sons. Price 10s. 6d. net.

"Senior Magnetism and Electricity," by R. H. Jude and J. Satterley. Third Edition. Pp. viii+458; figs. 260. London: W. B. Clive, University Tutorial Press, Ltd. Price 6s. 6d.

"Mechanism of Standard Cost Accounting," by T. Downie, Jun. Pp. 117. London: Gee & Co. (Publishers), Ltd. Price 15s. net.

Handbook of the Bureau of Standards, No. 10. "Safety Rules for the Installation and Maintenance of Electrical Supply and Communication Lines," comprising Part 2 of the Fourth Edition National Electrical Safety Code. Washington: Government Printing Office. Price 60 cents.

"*Journal* of the American Institute of Electrical Engineers." Vol. XLVI. No. 9. September, 1927. New York: The Institute. Price $1.

"Science Abstracts" (A & B). Vol. XXX. Part 9. September 25th, 1927. London: E. & F. N. Spon, Ltd. Price 3s. each.

The Lighting Season.

The winter lighting campaign of the GENERAL ELECTRIC CO., LTD., centres around the "Pearl Osram" lamp and the cult of sun worship. The principal figure in all the advertisements is an Egyptian of the XIIth Dynasty raising his hands to the sun, and the question is asked: "Are you a Shemsu-Ra (or follower of the sun)?" In addition to the usual priced pamphlets, showcards, &c., a booklet has been produced dealing with sun worship. The principal article is by that well-known authority, Sir E. A. Wallis Budge, who was formerly in charge of the Egyptian and Assyrian antiquities of the British Museum. Other brief articles are contributed by Sir W. Arbuthnot Lane and the scientific adviser of the New Health Society, while the remainder of the booklet describes the "Pearl Osram" and states prices.

The sign of the "Royal Ediswan" lamp during the ensuing season is a hand holding one of the lamps and a "slogan" counselling the reader to nurse his sight. The nurse who was a feature of last season's advertising by the EDISON-SWAN ELECTRIC CO., LTD., again appears, on a smaller scale.

State Participation in Swiss Electrical Manufacture.

The *Elekroindustrie* for September says that a new company is about to open works at Nidau for the manufacture of electrical machinery. It goes on to state that the parties interested in this new venture are the Entreprises Electriques Bernoises and the Entreprises Electriques of the canton of Zurich. As the latter society is entirely in the hands of the State, the paper in question considers it its duty to call the attention of the public and of those interested in the manufacture of electrical machinery to this new development of nationalisation, and thinks that publicity should be given to the step taken by the Swiss authorities. It appears that the necessary capital has already been subscribed, and the date for the opening of the works is fixed for December 1st.

Production and Selling.

In an address before the recent Convention of the Association of Electragists, Mr. D. Hayes Murphy, of the National Electrical Manufacturers' Association, said that electrical manufacturers and contractors had both developed their ability to produce more rapidly than they had developed their ability to sell. Of all the conditions which made business unprofitable excess capacity to produce was the most common and it was the worst. There were two remedies: One was to lay off half the employés and restrict production, and the other was to increase consumption—that was, develop more business. No one was willing to restrict production unless he knew that his competitor was going to do likewise. To restrict production by agreement with competitors, however, was illegal, and even if it were not illegal it was bad business. To increase consumption, on the other hand, by co-operative advertising and co-operative market building was a perfectly proper association activity and one which could readily be made immensely profitable both to the contractors and manufacturers as a whole. He urged that the two associations should get together and help each other to solve the problem of expanding the market to ensure the sale of articles produced in quantity.

New Scottish Showrooms.

The Clyde Valley Electrical Power Co. has established a showroom at its central offices, St. Vincent Street, Glasgow, where domestic electrical fittings and accessories of every description are exhibited and their uses demonstrated. The company has instituted a hire-purchase system.

Fuel Gas from Lime Burning.

At the recent statutory meeting of the Reid Power Development Co., Ltd., the chairman, Lt.-Col. H. S. Davey, C.M.G., said that the company was formed to develop and bring to the commercial stage certain patents for the production of fuel gas from the process of lime-burning under a licence from the company holding those patents. He said that the company's appeal to the public for capital had been "somewhat disappointing," but they were negotiating with a trust company for the purchase of the balance of the shares.

"The object of this company is to establish and prove to all and sundry what we who are familiar with the process know to be the fact, that gas to drive a gas engine or to fire a boiler can be derived in effective quantities from the process of lime-burning. When that is demonstrated to the electrical, engineering and lime-burning industries, your directors and their technical advisers are convinced that a great and important change of method in those industries must result as a consequence of improved and cheaper power production."

Compulsory Electrical Outlets.

Mr. L. W. Going, Chief Electrical Inspector of Portland, Oregon, points out in a recent article in *The Electragist* that that city's electrical code requires the compulsory installation of convenience outlets in several rooms of a dwelling. "Our code contains many other provisions which on first thought appear to have no direct relation to fire or personal hazard, but experience has taught us that hazardous extensions are sure to result when outlets are omitted in locations where lights are nearly always needed, and that overloaded and overfused feeders and circuits are sure to follow inadequate circuiting and feedering." It was in Oregon, recently, that penalties were inflicted on the proprietors of a store for selling a cheap electric toaster which was held to be dangerous to the user. As we reported at the time, the action was brought by the city's deputy electrical inspector.

Strike at Macintosh Cable Works.

Last week seven or eight hundred employés of the Macintosh Cable Co., Ltd., ceased work as a protest against the dismissal of some of their number. The general manager offered to meet a deputation to discuss alleged grievances if the men would return to work in the meantime, but this they refused to do. It is understood that the men demand the removal of a works superintendent who is alleged to have dismissed or suspended certain employés.

The strikers returned to work on Friday last, the managing director promising to hold an inquiry into the matters which led to the stoppage.

Mine Electrification Reduces Costs.

Speaking at last week's meeting of the Pena Copper Mines Co., the chairman said that the company's mines were now entirely operated by electrical methods. The installation was one of the best of its kind in Spain, and had "helped to reduce costs to an extent which but two years ago would have seemed impossible."

Recent Contracts.

Among the recent contracts received by the LEA RECORDER CO., LTD., are the following:—Boiler feed and condensate recorders.—Repeat orders from Wallasey, Southport, Exeter and Kettering Electricity Works, South Metropolitan Gas Co., Pilkington Bros., Brunner, Mond & Co., and one of the large textile combines (17). Coal meters.—Bristol Electricity Works (10), Athens Electricity Works (18), and Singapore Electricity Works (12), also many other orders from Japan, Australia, India and South America, and repeat orders from Torquay, Croydon, Preston, Aberdeen, Cardiff, City of London E.L. Co., Ltd., Newcastle-upon-Tyne Electric Supply Co., Ltd., County of London Electric Supply Co., Ltd., &c.

At the new White Rock Pavilion, Hastings, the boiling water for the cafés and tea balcony is provided by two electrically-heated café fountain boilers made by Messrs. JACKSON BOILERS, LTD.; these machines also supply coffee and hot milk. The boilers are automatically controlled, the operator only having to switch on the current in the morning and off in the evening. The boilers are consequently as fool-proof as it is possible to make them and they are therefore eminently suitable for use in still-rooms, &c., where the attendants often know little or nothing about electricity. The company has also received an order for a machine for the canteen in the new Ferrybridge power station of the Yorkshire Electric Power Company.

The Hodbarrow Mining Co., Millom, Cumberland, has placed a contract for the sinking of a new shaft by means of the freezing process. A contract has been placed for an electric winding plant with the METROPOLITAN-VICKERS ELECTRICAL CO., LTD. The mechanical parts of the winder are being made by Messrs. MURRAY & PATERSON, LTD., Coatbridge, and the method of winding is by means of skips with automatic tipping and delivering to an aerial ropeway. Extensive additions to the electrical system are in hand for transmitting power from the company's generating station to the new sinking, and the contract for this has been placed with Mr. R. M. RUSSELL, Glasgow. To meet the increased demands for compressed air, an order has been placed with Messrs. BELLISS AND MORCOM, LTD., for an additional steam-driven compressor. The consulting engineers for the scheme are Messrs. Walter Dixon & Co., Glasgow.

The BROWN, BOVERI organisation has recently received an order from Japan for two three-phase, 30,000-kVA synchronous condensers to run at 600 r.p.m., for use on an 11,000-V, 60-cycle system. They will be provided with direct mounted main and auxiliary exciters and induction motors for starting purposes. In addition the order comprises a stand-by exciter set and the necessary switchgear with automatic voltage and current-limiting regulation. These synchronous condensers, the concern states, will be the largest so far manufactured in Europe. A second order has been obtained for the extra-high-pressure turbine equipment for the extensions to the Mannheim super-power station for which the boiler pressure will be 1,400 lb. per sq. in. There will be two sets, the first consisting of a primary turbine to run at 3,000 r.p.m. This turbine will exhaust to the existing steam turbines, and also to a direct-coupled extraction back-pressure pre-heating or regenerative turbine. The primary and back-pressure turbo-set will be coupled to an existing Brown-Boveri 10,000-kVA alternator, which up to the present has been used as a synchronous condenser. The second set will consist of primary and back-pressure turbines similar to those described. This turbo-set will be coupled to a three-phase, 4,800-kW alternator. It is said that the turbines will be the first in the world to operate at such a high pressure for public electricity supply.

The ARTISTIC SHADE CO. has recently supplied shades for the following:—The New Tivoli Cinema, Yardley, Birmingham; the Palladium Cinema and Lyric Theatre, Birmingham; the Rialto, Liverpool; the Palais de Danse, Aberdeen; and the Prince of Wales Hotel, Southport. The company carried out the decorative lighting scheme at the recent Dancing Exhibition held at the City Hall, Manchester.

Unemployment.

The total number of registered unemployed fell by 22,020 to 1,052,600 during the week ended September 12th. Upon the corresponding date of 1926 the number was 1,551,920 (coal dispute period).

A Co-operative Society's Electrical Trade.

The Leeds Co-operative Society has its own electrical department, which had a turnover of £6,803 in the past six months, making a profit of £316.

New Zealand Contracts for British Firms.

The High Commissioner for New Zealand announced last week that British manufacturers had recently secured important orders for electrical equipment for the Government Railway workshops. The orders include four 100-ton and two 25-ton overhead travelling cranes and other equipment to a total value of £75,000.

New Municipal Showrooms.

The new showrooms erected by Keighley Electricity Committee were recently formally inaugurated by the Mayoress.

New electricity offices and a showroom were recently opened by the Holmfirth Urban District Council.

Fire at A.E.G. Works.

On Sunday last a fire broke out at the Berlin works of the Allgemeine Elektricitäts Gesellschaft. A packing material store and some offices were burned out, and some time elapsed before the fire brigade was able to subdue the flames. Owing to the necessity of cutting off the electricity supply a large section of the city was kept in darkness during the evening.

For Sale.

Bedford Corporation Electricity Department invites offers for one 1,000-kW mixed-pressure turbo-alternator and condensing plant. (See our advertisement pages to-day.)

Prices of Raw Materials.

Messrs. F. Smith & Co. report, September 27th:—Copper (electrolytic) bars, £62, 10s. dec.; do. do. sheets, no change; do. do. wire rods, £72, 10s. dec.; do. do. h.c. wire, 9 1/16d., 1/16d. dec.

Messrs. James & Shakespeare report, September 27th:—No change in the prices of copper bars (best selected) sheet and rod; English pig lead, £22 5s., 20s. dec.

Messrs. Edward Till & Co. report, September 27th:—India-rubber, Para fine, 1s. 2½d., ½d. dec.

Messrs. James Forster & Co. report that the Metal Exchange statistics for August, published on the 22nd inst., are interesting, insomuch as they show that the total shipments of lead during that month from Australia were over 16,000 tons, as against 7,400 tons during the previous month. It would appear therefore that at all events for next month there will be no shortage of arrival lead. The Board of Trade returns for August are:—Imports, 22,535 tons; exports, 1,362 tons; leaving for home consumption 21,173 tons.

Electrical Aids to Egg Production.

There is a likelihood of extended use being made of electricity for intensive egg culture in Lancashire, following the successful experiment of a Preesall poultry farmer. The Preesall Council has offered to supply electricity at 3d. per kWh for this purpose.

Lighting and Power Notes.

Aberdeen.—YEAR'S WORKING.—The report on the city electricity undertaking (engineer: Mr. J. A. Bell) for the year ended July 31st last shows a total income of £230,201, as compared with £196,108 in the preceding year. The higher cost of fuel was responsible for an increase in working expenses from £105,096 to £131,006, leaving a gross profit of £99,195, as against £91,012. After payment of capital charges there was a net surplus of £10,991, as compared with £10,985 in 1925-26. The capital expenditure during the year amounted to £135,313, the chief items being £51,218 for land and buildings, £52,856 for machinery, and £16,950 for mains and services. The electrical energy sold increased from 26,779,912 to 30,157,653 kWh. The number of heating and cooking appliances let out on hire increased by 1,718, making a total of 7,943.

Ashbourne (Derbyshire).—OPPOSITION TO SCHEME.—The Urban District Council has decided to raise objection to the application of the Nottinghamshire and Derbyshire Electric Power Co. for a Special Order authorising it to supply electricity in the urban district and certain parishes in the rural district on the grounds that the Council has statutory powers to supply gas in the area, and that it is considering the desirability of applying for its own Order to purchase electricity in bulk and distribute it.

Australia.—SWAN HILL (VIC.).—The first section of the Swan Hill (Vic.) Shire Council's h.p. electricity supply service has been completed to Ultima, 20 miles from Swan Hill power house. Within two months the whole district will be served for an area of 400 sq. miles. It is claimed that it will be the largest and most up-to-date electricity scheme, apart from Yallourn, in the State.

VICTORIA.—The *Industrial Australian and Mining Standard* states that the demand for power supply from the Victorian State Electricity Commission has exceeded all expectations. Unless immediate action is taken to increase the generating plant at Yallourn, there will be a power shortage in Victoria next year, in spite of the supply which will be obtained from the Sugarloaf hydro-electric scheme. It has been decided, therefore, to install another turbo-generator at Yallourn. The cost of this additional plant will be £90,000.

Believing that the Bendigo City Council will favour the extension of the State Electricity Supply undertaking to that city, the Electricity Commission has adopted important proposals for a service to the area between Melbourne and Bendigo. The Commission proposes to undertake in the current financial year an extension of its transmission system, from Sunbury in the direction of Castlemaine. This work will form the basis of the ultimate main link to Bendigo and beyond. The towns to be served immediately will include Gisborne, Riddell, Lower and Upper Macedon, Woodend and Kyneton. An extension to Castlemaine probably will follow, and the trunk supply line also will offer possibilities of branch extension eastward to Romsey, Lancefield, and Kilmore, and westward to Daylesford. The plan for the supplies to the centres mentioned will be based upon the control of local distribution being in the hands of the Electricity Commission.

BRISBANE.—According to the *Australasian Electrical Times*, the first of the B.T.-H. sets for the Town Council's new power station at New Farm has been delivered. Two of these sets, each of 7,500 kW, 11,000 V, 50 cycles, 3-phase, are to be installed. Material for the four Babcock and Wilcox boilers which will supply steam for these sets is on the site and is being assembled. The delivery of the travelling crane for the turbine room was expected at the end of July, and when this is erected work on the first set will be commenced.

Aylesbury.—NEW PLANT.—The Town Council has applied for sanction to a loan of £38,063 for the installation of a 3,000-kW set, together with the necessary boiler and auxiliaries.

Ayrshire.—YEAR'S WORKING.—We have received from Mr. W. C. Bexon, engineer and general manager to the Ayrshire Electricity Board, a copy of his report, together with the statement of accounts for the year ended May 15th last. The total income amounted to £273,058, as compared with £194,732 in the preceding year. The coal dispute was responsible for an increase in working expenses from £75,861 to £140,025, leaving a gross profit of £133,033, as against £118,871. Capital charges absorbed £124,150, and there was a net surplus of £8,883, as compared with £2,065 in 1925-26. The capital expenditure during the year amounted to £108,837, the chief items being £78,892 for mains and £19,299 for machinery. The total now spent on the undertaking stands at £1,491,375. The electrical energy sold increased from 27,531,654 to 31,382,423 kWh, and the maximum supply demanded from 14,200 to 17,300 kW. The average price obtained per kWh increased from 1.693d. to 2.083d. Application has been made for sanction to a loan of £370,000 for extensions, which include the installation of two new boilers.

Bedford.—LOAN.—The Corporation Electricity Committee is applying for sanction to loans of £10,000 for meters and £8,000 for apparatus to be let out on hire.

Belgian Congo.—ELECTRICAL PROGRESS.—The report for the last financial year of the Société Coloniale d'Electricité indicates that steady progress is being made in the use of electricity in the Belgian Congo. The minimum demand guaranteed by the Government is now being exceeded, last year's demand on the station at Elizabethville showing an increase of 82 per cent. over 1925. In the Leopoldville-Kinshasa area the distribution system has been completed and was brought into use towards the end of 1926. The company has secured the concession for the supply of electricity in the Likasi area, and is in negotiation with regard to the supply in other districts of the Belgian Congo.

Blackpool.—AUTUMN ILLUMINATIONS.—For the autumn illuminations which were inaugurated on September 24th, there are three miles of coloured electric lamps, illuminated arches, pillars and pylons, electric fountain, illuminated shelters, kiosks, &c. The scheme comprises 100,000 lamps. In addition to the cable required for the lamps themselves, over 12 miles of feeder cables have been installed. The scheme has been rendered possible by the inauguration of the new bulk supply from Preston. Many of the novel fittings to be employed during the illuminations week were made in the Corporation workshops. The scheme is being carried out under the direction of Mr. C. Furness (borough electrical engineer), Mr. F. Field (resident engineer, Tramways Department), and Mr. H. F. Shonahan (mains superintendent).

Bo'ness.—SUPPLY TO ELECTRICAL STAFF.—The Town Council has approved recommendations by the Electricity Committee to supply the staff and employés with electricity at 3d. per kWh, being half of the ordinary charge, and that the minimum charge be discontinued.

Bristol.—YEAR'S WORKING.—We have received from Mr. H. Faraday Proctor, chief engineer and general manager of the city electricity undertaking, a copy of his report, together with the statement of accounts, for the year ended March 31st last. The total revenue amounted to £519,857, as compared with £466,222 in the preceding year. The coal dispute was responsible for an increase in the cost of fuel of £82,956, and working expenses were therefore higher at £334,925, as against £256,582, with a consequent decrease in the gross profit from £209,639 to £184,932. To the gross profit was added revenue from other sources making a total of £199,407. Capital charges absorbed £141,010, and there was a net surplus of £58,397, as compared with £95,570 in the previous year. A contribution of £17,000 was made to the district rate. The capital expenditure during the year amounted to £365,921, and included £200,849 for mains and £56,157 for machinery at Feeder Road works. The total now spent on the undertaking stands at £2,372,461. The sales of electrical energy increased from 64,183,737 to 67,596,193 kWh, and the maximum supply demanded from 30,893 to 34,285 kVA. The average price obtained per kWh increased from 1.60d. to 1.72d. The number of new consumers connected increased by 3,684 to 23,922, constituting a record. The length of cable laid was 74 miles, making the total 683 miles.

Burton-on-Trent.—ASSISTED WIRING SCHEME.—The Corporation Electricity Committee has decided to inaugurate an assisted wiring scheme, and is to borrow £3,000 to finance it. Arrangements have been made with local contractors to undertake the installations.

Continental.—FRANCE.—A report recently issued by the Groupement des Producteurs d'Energie d'Alsace et Lorraine shows that in the three leading districts of these two departments of France the installed generating plant has increased from 82,000 kW in 1920 to 180,000 kW at the end of 1926. During last year 460 million kWh was supplied to 1,270 communes, as against 240 million kWh to 850 communes six years ago. The report adds that plans are being prepared for an e.h.p. transmission line to connect the power stations at Mulhouse, Strasburg, and Creutzwald.

SWITZERLAND.—An application has been made to the Cantonal authorities of St. Gall for a concession to establish a hydro-electric station to use the water power of the Wangser and Vilter mountain lakes in the Eastern Switzerland range.

The municipal authorities of Lugano have received Government authority to "export" 1,000 kW of electricity from their electricity station to the Società Varesina per Imprese Elettriche, of Varese, Italy.

HOLLAND.—A new four-stage steam turbine and generator of 16,000-kW capacity and a 14,000/17,000-kW two-stage set have recently been installed at the power station at Utrecht. The four-stage machine was built by the Erste Brunner Maschinenfabrik, of Brunn, Czecho-Slovakia, and the 14,000/17,000-kW set by the A.E.G., of Berlin. Steam for the Erste Brunner machine, which runs at 3,000 r.p.m., is supplied by a battery of four boilers built by Stork Bros., of Hengelo, Holland, and designed for a steam pressure of 530 lb. per sq. in. at a temperature of 425 deg. C.

THE TYROL.—In the presence of representatives of the German and Austrian Governments, the large new Achensee hydro-electric power station which has been established in the Inn valley, near Innsbruck, was officially inaugurated on September 19th. The plant will have an annual output of 106 million kWh, of which about 85 million kWh will be utilised in Bavaria.

Epsom.—LOAN SANCTIONED.—The Urban District Council has received sanction to a loan of £2,000 for domestic apparatus to be let on hire.

India.—ELECTRICAL DEVELOPMENT.—Important additions and extensions to electrical plants in various cities in the United Provinces are reported. At Lucknow and Allahabad, where electricity is supplied by the U.P. Electric Supply Co., it is stated that the erection of the new 310-kW alternator has been completed. At Allahabad the mercury-rectifier station is also completed. It is also understood that an order has been placed for two 1,000-kW turbo-alternators to supply electricity to the new water-pumping plant which is being installed by the Municipal Board of Allahabad. Boiler plant, including economisers, mechanical stokers, &c., has also been ordered, and an agreement has been entered into with the Municipal Board to supply power to the pumping plant from June, 1928, by which time the turbine plant will be completed. The erection of a 310-kW alternator at Agra has been completed, and the set is now available to meet the station load as required. At Jubbulpore the whole of the plant has been received, erection work is nearing completion, and it is expected that a supply will shortly be available. Plant has been received and erection work has been completed at Muttra.

Inverness.—ABOLITION OF METER RENTS.—On the recommendation of the engineer and manager, the Town Council has agreed that after the end of the current quarter no rental shall be charged for electricity meters. The contract system for lighting is to be reintroduced, and shopkeepers are to be offered cheap electricity for window lighting after closing hours.

Isle of Wight.—OVERHEAD CABLE.—The Rural District Council has consented to an application from the Isle of Wight Electric Light and Power Co., Ltd., for permission to place an overhead cable along the railway between Shanklin and Ventnor for the transmission of electricity at 10,000 V, subject to approval by the Shanklin and Ventnor Urban District Councils.

Leeds.—NEW POWER STATION.—The Corporation Electricity Committee recently took the first step in connection with the construction of a new power station at Kirkstall, when it had before it tenders for the initial section of the undertaking, comprising boiler plant and the necessary buildings. The complete scheme, of which only about a third will be proceeded with at present, will cost over £2,500,000. The station when completed will include six 25,000-kW sets and boiler plant of nine units. The first part of the scheme will be completed in about two years.

London.—ST. PANCRAS.—The Finance Committee has recommended that a sum of £11,389 be allocated from the electricity profits for the year ended March 31st last towards the relief of the rates.

STOKE NEWINGTON.—The Finance Committee has recommended that application be made for sanction to a loan of £5,000 for meters.

ST. MARYLEBONE.—The Electricity Committee has recommended that additional transformers and switchgear equipment be installed upon the premises of large consumers, and that application be made for sanction to a loan of £38,208, made up as follows:—Transformers, £10,350; switchgear, £13,533; cables and incidentals, £14,325.

HAMMERSMITH.—The Finance Committee has reported receipt of sanction to loans of £21,475 for boiler-house plant, &c., and £39 728 for mains, transformers, switchgear, &c.

STEPNEY.—We have received from Mr. W. C. P. Tapper, engineer and manager of the borough electricity undertaking, a copy of his report, together with the statement of accounts, for the year ended March 31st last. The total revenue amounted to £306,080, as compared with £259,286 in the preceding year. As a result of the coal dispute, working expenses increased from £143,054 to £192,555, leaving a gross profit of £113,526, as against £116,232, to which was added revenue from other sources, making a total of £115,093 available. Capital charges absorbed £110,555, and there was a net surplus of £4,538, as compared with £29,447 in 1925-26. The capital expenditure during the year amounted to £163,620, the chief items being £81,721 for mains and services, £33,799 for machinery, and £23,145 for buildings. The sales of electrical energy amounted to 48,063,651 kWh, an increase of 3,026,544 kWh, and the maximum supply demanded rose from 24,770 to 26,400 kW. The average price obtained per kWh increased from 1.351d. to 1.489d., and the cost per kWh from 1.194d. to 1.467d. In April, 1926, the Council approved estimates for a further extension of Limehouse power station to include one 20,000-kW turbo-alternator, with boilers and accessories.

New Malden.—STREET LIGHTING.—The Urban District Council has sealed a contract with the Wimbledon Corporation for public lighting by electricity.

Northern Ireland.—PORTRUSH (CO. ANTRIM).—The Urban District Council has received sanction to a loan of £4,011 for electricity purposes.

Price Reductions.—Reductions in the charges for electricity have been made or recommended in the following districts:—

FALKIRK.—Lighting: From 5d. to 4d. per kWh. Theatre and outside lighting: From 4½d. to 3½d. per kWh. A reduction has also been made to large power consumers.

HAMILTON.—Lighting: From 6½d. to 6d. per kWh. Heating: From 1½d. to 1d. per kWh.

SWANSEA.—Lighting: Flat rate from 5½d. to 5d. per kWh. Maximum demand system: The war increase from 20 to 10 per cent. Heating and cooking: Flat rate of 1d. per kWh. Power: The war increase of 12½ per cent. to be abolished.

BEXHILL.—Lighting: From 5½d. to 5d. per kWh. Power: From 1½d. to 1d. per kWh.

BOGNOR.—*Bognor Gas and Electricity Co.*—Power: From 2½d. to 2d. per kWh. Heating and cooking: From 2d. to 1½d. per kWh.

Stoke-on-Trent.—NEW PLANT.—The Corporation Electricity Committee has received sanction to the extension of the generating station by the installation of one 12,500-kW three-phase, 50-cycle turbo-alternator and two 60,000-lb. boilers. The electrical engineer is to prepare estimates for the extension.

"ALL-ELECTRIC" HOUSES.—The engineer has prepared particulars of costs, &c., in connection with the all-electric houses since they were occupied in the middle of April last. The electrical energy consumed for lighting was 121 kWh; for heating and cooking, 5,106 kWh; and for water heating, 4,414 kWh, making a total of 9,641 kWh. The average cost per week was 7½d. for lighting, 5s. for heating and cooking, and 2s. 1½d. for water heating, or a total of 7s. 9½d. per week per house.

Swansea.—LOAN.—The Corporation Electricity Committee is applying for sanction to the borrowing of £10,000 for meters.

Warrington.—YEAR'S WORKING.—The accounts of the Corporation electricity undertaking (engineer: Mr. F. V. L. Mathias) for the year ended March 31st last, show a total revenue of £128,650, as compared with £115,102 in 1925-26. Working expenses amounted to £83,511, as against £70,919, leaving a gross profit of £45,139 (£44,183), to which was added interest on investments of £1,020, making a total of £46,159 available. After providing for capital charges, there was a net surplus of £7,293, as compared with £10,319 in the preceding year. The capital expenditure during the year amounted to £36,562, and included £19,195 for mains and services. The sales of electrical energy increased from 17,179,291 to 18,244,770 kWh, and the maximum supply demanded from 7,796 to 8,290 kW.

West Midlands.—TRANSMISSION LINES.—Work has recently been completed on the laying of three 11,000-V cables between the Walsall electricity undertaking and that of Wolverhampton, in connection with the West Midlands scheme.

Important extensions are now in progress at the Birchills generating station, and it is expected that the official linking-up ceremony will take place at the end of the year.

Tramway and Railway Notes.

Bradford.—YEAR'S WORKING.—We have received from Mr. R. H. Wilkinson, general manager of the Corporation tramway undertaking, a copy of his report, together with the statement of accounts for the year ended March 31st last. The total revenue amounted to £587,600, as compared with £621,963 in the preceding year, the decrease being due to the general strike. Working expenses decreased from £491,042 to £476,575, leaving a gross profit of £111,024, as against £130,921.

The railless-car system showed a total income of £27,655, as compared with £22,772 in 1925-26. Working expenses, &c., amounted to £30,727, as against £25,759, leaving a gross deficit of £3,072 (£2,987).

The motor-omnibus and parcels department showed gross profits of £5,122 and £679 respectively, which, with the gross profit from the tramways and the gross deficit from the railless cars, were transferred to net revenue account. After payment of capital charges, &c., there was a net surplus for the whole of the undertaking of £15,010, as compared with £29,644 in the preceding year. A contribution of £10,000 was made to the city rate. The capital expenditure during the year amounted to £77,165, and included £30,013 for permanent way and £13,686 for cars. The number of passengers carried decreased from 101,312,107 (railless cars, 4,050,469) to 97,565,980 (railless cars 4,661,704), but the car mileage increased from 7,082,569 (railless cars, 458,888) to 7,148,250 (railless cars, 548,793). The total revenue per car mile decreased from 22.273d. to 21.809d. A railless-car service between Bradford and Clayton was formally inaugurated on September 4th, 1926. The total length of routes on this system is now approximately 13 miles.

Continental.—BULGARIA.—*La Bulgarie* states that the present tramway system in Sofia was established to serve a population of 100,000, and that the present population is nearly 300,000. A technical commission was therefore ap-

pointed last year by the Municipality to study the question and draw up a programme for extending the system. This commission finds that there is need for the construction of three loops, a girdle line and extensions of the existing lines, the loops and girdle line to be commenced first; these lines mean an extension of the system by 16.8 km. For the internal needs of the town 110 cars, with motors and as many trailers, would be necessary. At present the Tramway Administration possesses only 40 cars with motors and 30 trailers; towards the beginning of next year 28 new cars will arrive from abroad. It will be necessary, therefore, to order 45 new cars, with motors, and 80 trailers. A sum of 46,800,000 leva will be needed for the extension of the lines, 89,500,000 leva for the new cars, and 10,000,000 leva for a new modern depôt. The present receipts amount to 180,000 leva a day. With the proposed extensions to the system, the average daily receipts should amount to about 500,000 leva.—*Reuter's Trade Service* (Sofia).

POLAND.—Work is well advanced on the construction of a new electric railway between Warsaw and Zyrardow, and it is expected that the line, which is twenty miles in length, will be opened for traffic before the end of the year.

Gravesend.—ABANDONMENT OF TRAMWAY.—In connection with the abandonment of the Gravesend, Rosherville and Northfleet Tramways, the *Financial News* reports that the Northfleet Urban District Council states that, as a consequence of representations by the Councils of Northfleet and Gravesend, alterations have been made in the Order to ensure that the company will abandon the tramways within three instead of twelve months, take up the track, and pay the road authorities the cost of reinstating the roads.

United States.—NEW YORK.—*The Times* reports that Mr. Samuel Untermyer, as counsel for the Transit Commission, on September 27th presented the Commission with an elaborate proposal for the formation of a new rapid-transit system for New York City. It involves the recapture by the city of the Brooklyn-Manhattan Transit Company's subway lines and the Interborough Rapid Transit Company's East Side subway, a total of 156 miles of line. There would then be left to the former company 48 miles of unprofitable surface and elevated railway lines, and to the latter 71 miles of subway and elevated railway lines, of doubtful value when operated independently. Eventually these isolated lines might be expected to be turned over to the city at a low price, as an alternative to bankruptcy. The proposal puts the cost of the first 156 miles to be recaptured by the city at $196,600,000 (£39,320,000).

Telegraph and Telephone Notes.

Brazil.—TELEPHONE CONTROL.—The American International Telephone and Telegraph Corporation announces that it has acquired a controlling interest in the Companhia Telefonica Rio Grandense, which does business in the States of Sao Paulo, Parana and Rio Grande do Sul in Brazil, says *T. & T. Age*. The Corporation recently acquired control of the Montevideo Telephone Co. and the Co-operative Telefonica Nacional of Uruguay, which together operate more than 19,000 telephones, and the Chile Telephone Co., the third largest in South America, operating more than 25,000 telephones.

International Telegraphy.—PROPOSED NEW REGULATIONS.—According to *The Times*, a Special Committee on International Telegraphy appointed by the Association of British Chambers of Commerce has presented a report which is to form the subject of an interview with the Postmaster-General at an early date. The Committee's proposals, which have been adopted by the Executive Council of the Association, include recommendations that the length of the standard code word be reduced from ten letters to five, at 50 per cent. of the present charge for ten-letter words; that that portion of the regulation of the Paris Conference, 1925, by which as from November 1st, 1926, numbers in deferred cablegrams, when written in words, may not exceed one-third of the number of chargeable text words, should be rescinded; that code words should be admitted in deferred telegrams; that the pronounceability test, which is already practically a dead letter, be formally abolished; that the Administrations which are parties to the International Telegraph Convention would be well advised to consider decreasing, rather than increasing, terminal and transit charges on international telegraphs; that arrangements should be made under the international regulations for promptly dealing with alterations or the regulations which may become necessary owing to the rapid development of the telegraph art, without waiting for the next International Conference; that all regulations governing international telegraphy should be made in joint conference attended by representatives of the Administrations, users of telegraphs, and of the cable companies; and that the limit of 15 letters to one word for place and street names in the address of a telegram should be abolished.

Norway.—TELEGRAPH SERVICE.—A representative meeting of merchants, held at Oslo on September 20th, discussed the increased time required for the transmission of telegrams between Norway and England. It was stated that the average period for sending messages to London was now as high as 108 minutes, compared with 63 minutes previously, and it was suggested the delay took place in England. A resolution was passed urging the Norwegian telegraph administration to seek to remedy the evil.—*Reuter* (Oslo).

Sweden.—TELEPHONE COMMUNICATION.—The telephone authorities announce that telephone communication will soon be established from places in north Sweden to Great Britain and Continental countries, with most of which Stockholm and south Sweden are already connected. A conversation between Hernoesand and Great Britain will probably cost about kr. 20 for every three minutes. It is expected that timber, paper, and pulp exporters in Middle Norrland will make extensive use of the new facilities for communication, especially with Great Britain and France. Telephone communication between Stockholm and Belgium will be opened in the near future, and communication with Holland will follow as soon as the new cable between Sweden and Germany is ready for use. Finland still lacks telephone communication with Sweden and the Continent, but plans are being considered for taking up the financial side of the problem in connection with the next Finnish Budget.—*Reuter's Trade Service* (Stockholm).

Transatlantic Cables.—U.S.A.-FRANCE CIRCUIT.—Having obtained from the French Government the requisite permission to land an additional cable at Le Havre, in order to give direct communication between France and North America, the Western Union Telegraph Company is, says *The Times*, making arrangements to lift one of its existing Transatlantic cables now terminating at Penzance (England), and to connect it directly to Le Havre.

According to *The Times*, the British Post Office refused to grant a licence to the Western Union Telegraph Co. to bring a new submarine cable from Havre into Penzance, for the purpose of joining it up with the Transatlantic cable, and as a result the company decided to pick up its Atlantic cable outside territorial waters, some three miles from the Cornish coast, and to make the connection there. It is estimated that this proceeding will cost about £55,000. The alternative offered by the Post Office was a direct line to France through London, at a cost of £40,000 a year.

The Telephone Service.—NEW SCOTTISH EXCHANGE.—A new central-battery telephone exchange was brought into service at Govan (Glasgow) on the 17th inst. The new switchboard, which was made and installed by Messrs. Siemens Brothers and Co., Ltd., of Woolwich, has 13 operators' positions, and is equipped for 700 subscribers, with an ultimate capacity of 2,000.

Radio Notes.

Broadcasting Services.—FIFTY-SEVEN IN OPERATION.—In a report emanating from the Electrical Equipment Division of the Department of Commerce, says *World Radio*, it is estimated that 18,000,000 receiving sets are now in use throughout the world and that 200,000,000 sets would be required to serve all of the people within the constant reception area on a basis of five persons to each set. Fifty-seven countries now maintain broadcasting services.

Czecho-Slovakia.—LICENCES.—The number of registered wireless subscribers in the country totalled 210,000 on July 31st last.

Public Loud-Speakers.—WEST HAM BAN.—Public loud-speakers which are too loud will be banned in West Ham, if the Borough Council adopts a recommendation of its Legal Committee. It is reported that there have been several complaints by local people about loud-speakers outside certain shops, and the Council has obtained Home Office sanction for a new bye-law to deal with the matter. The new law, which was to be considered by the Council at its meeting on September 20th, imposes a penalty not exceeding £5 on any person who "in any street or public place or in any shop, business premises, or place which adjoins any street or public place, and to which the public are admitted, shall operate a wireless loud-speaker or gramophone in such a manner as to cause annoyance or disturbance."

Unauthorised Transmission.—EXPERIMENTER FINED.—The magistrates at Eccles, Lancashire, on September 19th, heard a case in which William Lucas (24), manager of a shop selling wireless materials at Swinton, was charged with having installed and worked transmitting apparatus without possessing the necessary licence authorising him to do so, says *The Times*. Mr. F. Elliott, solicitor, who appeared on behalf of the Postmaster-General to prosecute, said that the authorities took a grave view of the case. Lucas had radiated messages last year under the call sign "5OB," and this year under the call sign "2EZ." Two offences were involved—that of installing apparatus for sending purposes and that of working the apparatus. For each action a licence was required. The defendant admitted both sets of transmissions, and the Bench imposed a fine of £2 2s. for each offence, and the defendant's apparatus was confiscated.

Contract Information.

When "Contracts Open" are advertised in our "Official Notice" pages, the date of the ELECTRICAL REVIEW containing the advertisement is given in parentheses below.

Contracts Open.

Armagh.—October 11th. Urban District Council. A.c. meters. (See this issue.)

Australia. — MELBOURNE.—Commonwealth Postmaster-General's Department. November 22nd. Insulated wire. (B.X. 3832.)*

November 28th. Telegraph instruments. (B.X. 3835.)*

Avonmouth.—October 10th. Port of Bristol Authority. Electric lighting installation for the transit sheds and granaries at the Royal Edward Dock. (September 23rd.)

Barrow-in-Furness.—October 17th. Electricity Department. One 6,000-kW turbo-alternator with condensing plant, one water-tube boiler (60,000 lb. per hour) with mechanical stoker, or pulverised fuel plant, coal-handling plant and storage bunkers. (September 16th.)

Bognor.—October 17th. Bognor Gas and Electricity Co., Ltd. Rotary convertor, switchgear, transformers, e.h.p. and l.p. cables. (September 23rd.)

Bray.—October 4th. Urban District Council. Erection of poles, cables, and wiring 68 houses. Specification from Mr. E. M. Murphy, surveyor to the Council, 27, Molesworth Street, Dublin.

Bury. — October 12th. Electricity Department. Two water-tube boilers, with superheaters, economisers, mechanical stokers, coal- and ash-handling plant. (September 9th.)

Caersws.—October 4th. Newton and Llanidloes Board of Guardians. Additions to Institution, with laundry block and electric lighting installation. Mr. A. Stanley Hill, architect, Severn Square, Newtown, Mont. (Returnable deposit of £2 2s.)

Chile.—SANTIAGO.—November 14th. Chilean Public Works Department. Plant for the Iquique Pintados Railway. Two 4-motor, 40-ton and one 3-motor, 5-ton electrically-operated overhead travelling cranes, "Selson" type, one 700-kg. capacity "Otis" type cargo lift. (A.X. 5198.)

Dartford.—October 15th. Electricity Works. One 750-kW synchronous induction motor generator, switchgear, &c. (See this issue.)

Dublin.—October 17th. Electricity Department. H.p. and l.p. circuit-breakers for 12 months.

Edinburgh.—October 8th. Corporation. Supplies for the Lighting, Cleansing, and other Departments for six months. Forms from 331, High Street.

Egypt.—CAIRO.—October 26th. Ministry of Public Works. 7,500-kW thermal power station for Belgas. (B.X. 3748.)*

Egyptian State Railways, Telegraphs and Telephones. Chief Inspecting Engineer, Queen Anne's Chambers, Broadway, Westminster, S.W.1. Supply of the following telegraph and telephone materials:—16,000 galvanised-steel insulator spindles; 16,000 white porcelain insulator cups; 20,000 copper binders; 20,000 copper tapes.

October 27th. 44,349 metres armoured and unarmoured underground cables.—*Reuter's Trade Service* (Cairo).

Greece.—ATHENS.—November 14th. Administrative Committee of the Port of Piraeus. Fifteen 2-ton harbour electric travelling cranes of the porch type. Specifications from the Commercial Department of the Greek Legation in London, 51, Upper Brook Street, W.1.

Hawarden. — October 13th. Electricity Department. E.h.p. and l.p. underground cables and fittings. (See this issue.)

London.—METROPOLITAN ASYLUMS BOARD.—October 5th. Alterations to the electric lighting installation at Queen Mary's Hospital, Carshalton. (September 16th.)

CENTRAL ELECTRICITY BOARD.—October 24th. 132,000-V overhead transmission lines for the Central Scotland Electricity Scheme, 1927. (September 23rd.)

METROPOLITAN WATER BOARD.—October 12th. Two 150-kW generators, switchboard, piping, &c., for Hampton pumping station. Chief Engineer, 173, Rosebery Avenue, E.C.

SOUTHWARK.—October 25th. Electricity Department. Cables for 12 months. (September 23rd.)

PADDINGTON.—October 11th. G.W.R. Electrical apparatus (insulators, &c.). (See this issue.)

Manchester.—October 3rd. Board of Guardians. Electric lamps for twelve months. Forms of tender from Mr. F. W. Greenhalgh, clerk to Guardians, Union Offices, All Saints'.

October 6th. Education Committee. Electric lighting installation at Victoria Avenue Municipal school, Blackley. Specifications from Education Offices, Deansgate.

October 26th. Electricity Committee. One electrically-propelled tower wagon. (See this issue.)

Milford Haven.—October 17th. Electricity undertaking. Generating plant, switchgear, battery of accumulators, &c., underground and overhead mains. (September 23rd.)

New Zealand.—DUNEDIN.—November 12th. Corporation tramways. One overhead travelling crane, with 2-ton electric hoist. (A.X. 5179.)*

NELSON.—November 15th. City Council. 750-kW steam turbo-alternator and auxiliaries. (B.X. 3794.)*

WELLINGTON.—November 15th. Postmaster-General's Department. Telephone cords. (B.X. 3836.)*

January 12th. New Zealand Government Railways. One 2-ton and one 1½-ton capstan and one 2-ton battery crane truck. Two motor-driven air compressors. A.X. (5254).

Southend-on-Sea.—October 3rd. Light Railways and Electric Lighting Department. Fuse boxes and troughs. (September 9th.)

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed.

Argentina.—BUENOS AIRES.—Buenos Aires and Pacific Railway Co.

Hydraulic press and pumps.—Hollings & Guest, Ltd.

Australia.—SYDNEY.—Electricity Supply Committee. Accepted:—

Instrument equipment for Bunnerong power station (£10,988).—Austral Engineering Supply Co., Ltd.

House-service switchgear. — Ferguson, Pailin, Ltd. (£13,396); Siemens (Aust.) Pty., Ltd. (£7,648).

Motor-generator sets (£1,808).—Australian General Electric Co., Ltd.

L.p. underground cables (£3,939).—Metropolitan-Vickers Electrical Co., Ltd.

N.S.W. Railways and Tramways.

3-core e.h.p. cable (£18,156).—Enfield Cable Works (Aust.), Ltd.

Electric-car equipment for 105 motor-cars and 100 trailer cars (Spec. 1,065), excluding gearing £303,304).—Metropolitan-Vickers Electrical Co., Ltd.

VICTORIA.—Country Roads Board.

One turbo-generating set and condensing equipment (£38,500).—Metropolitan-Vickers Electrical Co., Ltd. —*Tenders.*

State Electricity Commission.

Additional turbo-generator, condenser, &c., for Yallourn (£38,500, including £13,200 for the condenser and pumping equipment to be manufactured by Thompson Bros., of Castlemaine, Victoria).—Metropolitan-Vickers Electrical Co., Ltd.

Belgium.—Belgian, German, French, Dutch, and British (Callender's Cable & Construction Co., Ltd., and British Insulated Cables, Ltd.) submitted tenders last week for the supply of 4,500 metres of l.p. cable to the municipal authorities of Schaerbeek, Brussels. The quotations ranged from 92,000 to 151,625 fr., the lowest being that of the Duisburg Kabelwerk Gesellschaft.

Bexhill.—Electricity Committee. Recommended:—

1,000 yd. twin and 500 yd. 3-core cable (£214).—Hackbridge Cable Co., Ltd.

Brighton.—Lighting Committee. Accepted:—

Screwed steel piles at new boiler house at Southwick (£660).—Braithwaite & Co., Ltd.

Extension of the e.h.p. mains from the Southwick power station to the North Road sub-station:—

Siemens Bros. & Co., Ltd. (approx.) (accepted)	**£44,000**
British Insulated Cables, Ltd. (approx.) ...	46,000
Callenders Cable & Construction Co., Ltd. (approx.)	49,000

Croydon.—Sewage Committee. Recommended:—

Electric crane and grab at the sewage works (£599).—Taylor & Hubbard.

Galashiels.—

Electric lighting of suite of new church halls erected by the Parish and St. Paul's Churches.—J. Adam & Son.

Glasgow.—Improvements Committee. Recommended:—

Electric lighting installations at buildings in Glasgow Cross (£1,311).—Kennedy, Robertson & Bain.

Government Contracts.—The following contracts were placed by various Government Departments during August:—

ADMIRALTY. CONTRACT AND PURCHASE DEPARTMENT.

Electric Cables.—Connolly's (Blackley), Ltd.; Enfield Cable Works, Ltd.; General Electric Co., Ltd.; Greenwich Cable Works, Ltd.; W. T. Henley's Telegraph Works Co., Ltd.; Hooper's Telegraph and I.R. Works, Ltd.; Johnson & Phillips, Ltd.; Siemens Bros. & Co., Ltd.; Standard Telephones & Cables, Ltd.
Electric overhead crane.—Vaughan Crane Co., Ltd.
Portable electric fans.—Electro Dynamic Construction Co., Ltd.; Turbon Patent Fan Co., Ltd.
Electric table fans.—General Electric Co., Ltd.
E.L. fittings.—Engineering & Lighting Equipment Co., Ltd.; Dorman & Smith, Ltd.; W. McGeoch & Co., Ltd.; General Electric Co., Ltd.
Telemotor operating gear.—McTaggart, Scott & Co., Ltd.
Motor generators.—Electric Construction Co., Ltd.
Electric lamps.—General Electric Co., Ltd.; Edison Swan Electric Co., Ltd.; Siemens & English Electric Lamp Co., Ltd.
Oil coolers.—Serck Radiators, Ltd.
Telemotor pumps.—Vickers, Ltd.; MacTaggart, Scott & Co., Ltd.
A.c. motor, switchgear, &c.—General Electric Co., Ltd.
Electric forge crane.—T. Smith & Sons (Rodley), Ltd.

WAR OFFICE.

5-kW generating sets.—Arrol-Johnston & Aster Engineering Co., Ltd.
Mercury arc rectifier equipment.—Hewittic Electric Co., Ltd.

AIR MINISTRY.

Ammeter and milliammeters.—E. Turner.
Generating set, Martlesham Heath.—Babcock & Wilcox, Ltd.
Generators.—W. Mackie & Co., Ltd.; G. E. Mortley; Sprague and Co., Ltd.
Motor generators and starters and combined regulators.—Newton Bros. (Derby), Ltd.
Filament lamps.—Siemens & English Electric Lamp Co., Ltd.
Magneto spares and repair of magnetos.—British Thomson-Houston Co., Ltd.
Silk insulating tape.—General Electric Co., Ltd.

POST OFFICE.

Telephone apparatus.—Phœnix Telephone & Electric Works, Ltd.; Peel-Conner Telephone Works (General Electric Co., Ltd.); Standard Telephones & Cables, Ltd.; Sterling Telephone & Electric Co., Ltd.; T. Watson.
Protective and miscellaneous apparatus.—A. C. Cossor, Ltd.; Phœnix Telephone & Electric Works, Ltd.; Power Equipment Co., Ltd.; T. Watson.
Telephone cabinets.—Siemens Bros. & Co., Ltd.
Cable (various).—British Insulated Cables, Ltd.; Callender's Cable & Construction Co., Ltd.; Connolly's (Blackley) Ltd.; Enfield Cable Works, Ltd.; W. T. Henley's Telegraph Works Co., Ltd.; Johnson & Phillips, Ltd.; Siemens Bros. & Co., Ltd.; Standard Telephones and Cables, Ltd.; Union Cable Co., Ltd.
Dry cells.—Ever Ready Co. (Gt. Britain), Ltd.
Loading coils.—General Electric Co., Ltd.
Cords for telephones.—British Insulated Cables, Ltd.; London Electric Wire Co. & Smith's, Ltd.
Ducts.—Key Engineering Co., Ltd.
Telegraphic ironwork.—D. Willets, Ltd.
Electric lamps.—British Thomson-Houston Co., Ltd.; Cryselco, Ltd.; Edison Swan Electric Co., Ltd.; General Electric Co., Ltd.; Metro-Vick Supplies, Ltd.; Siemens Electric Lamps & Supplies, Ltd.
Lead sleeves.—G. Farmiloe & Sons, Ltd.
Solder.—British Insulated Cables, Ltd.
Copper wire.—Pirelli General Cable Works, Ltd.
Switchboard wire.—General Electric Co., Ltd. (Peel-Conner Telephone Works); Siemens Bros. & Co., Ltd.
Bending wire.—F. A. Power & Sons, Ltd.
Manufacture, supply, drawing-in and jointing cable.—Manchester-Rochdale (No. 3): British Insulated Cables, Ltd. Newcastle-Sunderland: Johnson & Phillips, Ltd.
Telephone exchange equipment.—King's Cross and Temple Bar, Haxby and Dringhouses (York Multi Exchange Area), and Windsor: Automatic Telephone Mfg. Co., Ltd. Temple Bar and Langham: Standard Telephones and Cables, Ltd. (Sub-contractors: Crompton & Co. for machines; D.P. Battery Co., Ltd., for batteries.). Electra Houses, Ltd. (E.C.): Standard Telephones and Cables, Ltd. (Sub-contractor: W. Jones & Co., for ringing machines.). Ambassador (Mayfair Relief): Standard Telephones & Cables, Ltd. Southampton: Siemens Bros. & Co., Ltd. Pendleton Co-operative Industrial Society, Ltd., Reading Corporation, Nelson Co-operative and Industrial Society, Ltd., Midland Bank, Ltd. (Piccadilly, W.), Shropshire, Worcestershire and Staffordshire Electric Power Co., and Wood Green U.D.C.: Relay Automatic Telephone Co., Ltd.
Tavistock telephone repeater station power plant.—Newton Bros. (Derby), Ltd. (Sub-contractors: Ruston and Hornsby, Ltd., for engine plant; Premier Accumulator Co. (1921), Ltd., for batteries.)
Manchester telephone repeater station stand-by power plant.—Newton Bros. (Derby), Ltd. (Sub-contractors: Ruston & Hornsby, Ltd., for engine plant.)
Manchester, 2-wire and 4-wire repeater equipments.—Standard Telephones & Cables, Ltd.

CROWN AGENT FOR THE COLONIES.

Cables.—W. T. Henley's Telegraph Works Co., Ltd., and London Electric Wire Co. & Smith's, Ltd.
Copper conductor.—R. Johnson & Nephew, Ltd.
Electric headers.—International Channelling Machines, Ltd.
Generating sets.—Campbell Gas Engine Co., Ltd.
Meters.—Ferranti, Ltd.
Overhead transmission line materials.—British Insulated Cables, Ltd.
Separators.—Chloride Electrical Storage Co., Ltd.
Solder.—General Electric Co., Ltd.
Sub-station equipment.—British Thomson-Houston Co., Ltd.
Telephones.—Ericsson Telephones, Ltd.
Train lighting equipment.—J. Stone & Co., Ltd.
Wire.—R. Johnson, Clapham & Morris, Ltd.
Wireless apparatus.—Marconi's Wireless Telegraph Co., Ltd.
X-ray apparatus.—A. E. Dean & Co.

H.M. OFFICE OF WORKS.

Imperial College of Science.—Wiring.—Gaillard, Robinson and Co.
National Physical Laboratory.—Cables, ducts, &c.—Power Lines Construction Co., Ltd.

Grimsby.—Electricity Committee. Recommended:—
L.p. cables for 12 months.—Connollys (Blackley), Ltd.; Greenwich Cable Works, Ltd.; and Johnson and Phillips, Ltd.

Irish Free State Government Contracts.—COMMISSIONERS OF PUBLIC WORKS.

Electrical work and supplies in the Dublin district.—Gleeson, O'Dea & Co., Ltd.
Electric lift for the National Gallery, Dublin, and repairs to lift, P.O. Stores.—Waygood-Otis, Ltd.

CONTROLLER OF STORES, POSTS AND TELEGRAPHS.

Terminal blocks.—De la Rue & Co., Ltd.
Switchboard cords.—Kromberg & Schubert.
Electric light fittings.—Edison Swan Electric Co., Ltd.
Porcelain insulators.—General Electric Co., Ltd.
Telephone parts.—Stromberg & Carston Mfg. Co.
G.i. wire.—W. F. Dennis & Co., Ltd.
Zinc rods.—Eyre Smelting Co., Ltd.
—*Irish Electrician.*

Leicester.—Electricity Committee. Recommended:—
1,500-kW rectifier plant, switchgear, &c., for new sub-station at Sanvey Gate (£16,101).—Hewittic Electric Co., Ltd.

London.—HAMMERSMITH.—Electricity Committee:—
Renewal of the pressure parts of No. 1 economiser plant (£960).—E. Green & Son, Ltd. (recommended).

ST. MARYLEBONE.—Electric Supply Committee:—
D.c. and a.c. ordinary and prepayment type service meters for 12 months.—Chamberlain & Hookham, Ltd., and Ferranti, Ltd.

STEPNEY.—Electricity Supply Committee:—
25 tons pitch (£124).—Smart's Tar Distillery, Ltd. (recommended).
Electrical conduit and fittings (£651).—Catchpole & Co. (recommended).

WESTMINSTER.—Board of Guardians.
12 months' contract for the supply of electric lamps, accessories and cables.—Metro-Vick Supplies, Ltd.

Newport (Mon.).—With regard to the Corporation contract for electrical plant, the *Western Mail* states that although the order has been placed with a Swiss firm as main contractors, at least two-thirds of the work will be placed with British manufacturers. The 10,000-kW alternator will be made by the General Electric Co., Ltd., and the condensing plant by Messrs. Worthington-Simpson, Ltd.

South Africa.—CAPE TOWN.—Electricity Committee:—
Four 100-kVA single-phase Hackbridge transformers (£576).—Hubert Davies & Co., Ltd. (Accepted.)
Standard-type switchgear (£3,670).—A. Reyrolle & Co., Ltd. (Recommended.)
Two 50,000-lb. Bailey boiler meters (£361).—Bailey Meter Co. (Recommended.)

Southend-on-Sea.—Town Council. Accepted:—
440 yd. traction cable (£397).—Union Cable Co., Ltd.
Railless car (£700).—Associated Daimler Co., Ltd.
3,000-5,000 tons of Diesel oil fuel (78s. 6d. per ton).—Shell-Mex, Ltd.

Sowerby Bridge.—Urban District Council. Accepted:—
Installing electric light at 50 houses at Beech Wood.—J. Harrison & Co.

Stoke-on-Trent.—Stores Committee. Accepted:—
Electric lamps.—Blackburn, Starling & Co., Ltd.; Welsbach Light Co., Ltd.; Barnett & Soans; J. V. Britain & Co., Ltd.; Hawley & Ingram.

Markets Committee. Accepted:—
Electric lighting installation at Tunstall Market (£179).—Tomlins, Ltd.

Swansea.—Swansea Improvements and Tramways Co., Ltd.

New coaches for the electrification of the Mumbles Railway.—Brush Electrical Engineering Co., Ltd.
Electrical equipment of rolling stock, &c.—British Thomson-Houston Co., Ltd.

Tynemouth.—Electricity Committee. Accepted:—
Cables, 1,000 yards (£576).—Greenwich Cable Works, Ltd.

Warrington.—Electricity Committee. Accepted:—
Superheater tubes for boiler.—Babcock & Wilcox, Ltd.
Earthenware conduits.—Albion Clay Co., Ltd.

The Electricity and Tramways Committee has decided that, owing to the great difference between the prices of the British and foreign tenders, the electrical engineer be authorised to purchase cables from the British Insulated Cables, Ltd., for a three months' supply only, at scheduled prices, and in the meantime the chairman and engineer are to interview the company on the matter and also make inquiries as to the terms and conditions of labour of foreign tenderers.

Wimbledon.—Electricity Committee. Recommended:—
New switch panel for No. 4 3,000-kW turbo-alternator (£454).—A. Reyrolle & Co., Ltd.

Worcester.—Standing Joint Committee. Accepted:—
Electric lighting fittings for the Shirehall (£130).—James Ward (Worcester), Ltd.

Wrexham.—Rural Council. Accepted:—
Installing electric lighting at 100 houses (£620).—Jones and Williams.

Forthcoming Events.

British Electrical Development Association.—Friday, September 30th. Royal Society of Arts. 7.30 p.m. "E.D.A. Circle Campaign, 1927-28." Mr. V. W. Dale.

Association of Mining Electrical Engineers (South Wales Branch).—Saturday, October 1st. South Wales Institute of Engineers, Cardiff. 6 p.m. Visit of the president of the Association. Address by the chairman, Major E. Ivor David.

E.D.A. Circle Campaign.—October 3rd. 1 p.m. National luncheons in London, Liverpool, Glasgow, Manchester, Birmingham, Cardiff, Belfast, Newcastle, Bath, Hull, Grimsby, South Shields, Norwich, Ipswich, Portsmouth, Hendon, Halifax, and Whitley Bay. Other Press functions at Hampstead, Ashford, and Greenock. October 10th. Luncheon at Edinburgh.

Society of Engineers.—Monday, October 3rd. Burlington House, W. 6 p.m. "The Lead Accumulator in Practice." Mr. R. C. Hall.

Association of Supervising Electrical Engineers.—Tuesday, October 4th. Junior Institution of Engineers, 39, Victoria Street, S.W. 7.15 p.m. Presidential address. Mr. A. M. Sillar.

Institution of Electrical Engineers (South Midland Students' Section).—Tuesday, October 4th. Queen's Hotel, Birmingham. 7 p.m. "Finance and Engineering." Mr. G. L. E. Metz.

Electrical Association for Women.—Wednesday, October 5th. Lighting Service Bureau, 15, Savoy Street, W.C. 7 p.m. "Electrical Circuits, Measurements, and Tariffs." Mr. J. W. Beauchamp.

Junior Institution of Engineers.—Friday, October 7th. 39, Victoria Street. 7.30 p.m. "Lubrication." Prof. E. Edser.

Diesel Engine Users' Association.—Friday, October 7th. Caxton Hall, Westminster, S.W. "Some Fuel Experiments in a Mechanical Injection Oil Engine." Mr. E. L. Bass.

Electrical Power Engineers' Association (Southern Division).—Saturday, October 8th. Hotel Cecil, Strand, W.C. 6 p.m. Annual dinner.

The "Electrical Review" Service Department.

INQUIRIES must be accompanied by a stamped addressed envelope.

We should be glad to learn the names and addresses of makers of the following:—

A small universal motor, the frame of which is a rectangular aluminium casting.

Notes.

The End of Summer Time.

Readers are reminded that "Summer Time" ends at 3 a.m. on Sunday next, October 2nd, when clocks should be put back one hour.

Legal.

ALLEGED CONSPIRACY TO DEFRAUD.—The adjourned summonses against Sir Charles Buckworth-Herne-Soame, Bt., Col. Edmund O. Eaton, and Robert G. Harley, charging them with conspiracy to defraud, were called at the Mansion House on September 21st. It is alleged that the defendants issued a prospectus in connection with the company known as the Chalk Fuel, Power, Gas and By-Products Corporation, Ltd., which contained false statements, fraudulently inducing the public to subscribe for shares, &c., in the company.

Counsel for Col. Eaton said that his client was still very ill, and it was also stated that Sir Charles Soame was suffering from injuries received in a motor accident. There was a fourth summons, against Edward Warden, but he was said to be deceased.

Ald. Sir George Truscott further adjourned the case until November 3rd.

The "Model Engineer" Exhibition.

The small-power engineering and scientific exhibition held at the Royal Horticultural Hall, London, last week revealed, as usual, some remarkable examples of the amateur model-maker's art, including, besides stationary and locomotive steam engines, several admirable replicas of electric locomotives, an L.C.C. electric tramcar, electric motors, electric chiming mechanism, and other subjects. There were some 50 stands, showing models, tools, materials, wireless apparatus, &c. One was occupied by Major Raymond Phillips's working model railways, the trains on which could be started, stopped, and reversed by wireless signals from a small portable transmitter, or, alternatively, by the spoken words "ahead," "stop," and "back." Mr. J. L. Baird's original apparatus for experiments on television was on view. The show was very popular with the younger generation—and a considerable proportion of their elders. Messrs. Percival Marshall & Co., proprietors of *The Model Engineer*, organised the exhibition.

Appointments Vacant.

Showroom, sales and publicity superintendent (£300), for the Lincoln Corporation Electricity Department. Lady demonstrator, for the Borough of Colchester Electricity Supply Department. Plumber-Jointer, for the Radcliffe U.D.C. Electricity Department. Meter tester and repairer, for the Hove Corporation Electricity Department. (See our advertisement pages to-day.)

Fatalities.

While out with companions near Chirk, Denbighshire, a 17-year-old youth, Lemsine Davies, of Pentre, climbed a steel tower supporting the main transmission line of the North Wales Power Co. and, touching the live wire, received a shock of 11,000 V. At the inquest on September 21st, it was stated that Davies was warned not to climb the standard. A verdict that death was due to shock and toxaemia following burns was returned, the jury suggesting that unclimbable fences should be placed round all standards.

The Wigan coroner held an inquest on September 22nd on three miners who met their death through the ignition of gas by an electric spark. Five men were working an electric coal-cutting machine in the Yard Mine of the Bickerstaffe Colliery, Skelmersdale, when there was a flash which seriously burned all of them. Two of the men recovered, but the other three died in Wigan infirmary. It was stated that the stud bolt connecting terminal and control chambers in the machine had worked out, and a half-inch aperture was left through which a flash could pass. A verdict of "Accidental death" was returned.

An inquest was held at Middlesbrough into the death of John Laughran, aged 31, of Teesville, employed at Messrs. Bolckow, Vaughan & Co.'s ironworks, who was killed when a long iron bar which he was using came into contact with a lighting cable. The evidence showed that the cable was 8 ft. above the platform on which he was working, and was considered out of reach. Laughran stepped back to allow another workman to pass, at the same time raising the bar, which, by a remote chance, struck the cable at a short section where the insulation had been worn away. He fell insensible, and artificial respiration was applied unsuccessfully for about ten minutes.

The cable carried a pressure of 230 volts. It was raining heavily at the time, and Laughran was standing in a pool of water. The bar was also very wet, and he thus received the full power of the current. The Factory Inspector (Mr. S. M. Bennett) pointed out that artificial respiration was tried for only a few minutes, although in such cases men had been revived after two hours, but Dr. J. Steele said that Laughran would be killed instantaneously.

The manager of the electrical department, in reply to a suggestion by the jury in returning a verdict of "Accidentally electrocuted," said that the work of covering all the lighting cables with metal tubing was proceeding

On Wednesday last week, according to the *City Press*, Dr. F. J. Waldo, the City Coroner, held an inquest on the death of Frederick Chappell, a builder's labourer, who was killed by electric shock at the Church of St. Mary Aldermary. The evidence showed that the deceased climbed a ladder to take down an electric lamp, and was found lying on the ground with the lamp-bulb near him; he died on the way to the hospital. Mr. A. Roberts, electrical engineer to the City Corporation, said the voltage was 210 V. Dr. Waldo, returning a verdict of "Death by misadventure," said that probably the deceased man had one foot on the wet concrete floor when he was disconnecting the lamp, and received a fatal shock, which could have been prevented by switching off beforehand. The apparatus was not in accordance with the I.E.E. regulations. Artificial respiration was kept up until the sufferer arrived at the hospital. Dr. Waldo also referred to the dangers of electrical street boxes, in connection with fires, and said the old Board of Trade rules were out of date.

The Electrical Association for Women.

Between October and December a course of six lectures is to be given on Wednesday evenings at 7 o'clock, at the E.L.M.A. Lighting Service Bureau, 15, Savoy Street, W.C.2, as follows:—

October 5th.—"Electrical Circuits, Measurements and Tariffs," by J. W. Beauchamp.
October 19th.—"A Demonstrator's Experience of Electric Cooking." Discussion opened by Mrs. L. Hollis (West Ham).
November 2nd.—"The Principles of Good Home Lighting," by W. E. Bush.
November 16th.—"The Care and Maintenance of Electrical Apparatus." Discussion opened by Miss G. Sharp.
November 30th.—"Simple Household Repairs," by Miss M. Partridge, B.Sc.
December 14th.—"Some Difficulties in Dealing with Consumers." Discussion opened by Miss M. G. Reading (City of London).

These lectures are free to members. For non-members there is a fee of 7s. 6d. for the course. They have been arranged by the Committee of Women Demonstrators specially to help women engaged in the electrical industry and those engaged in teaching domestic science, &c.

The Manchester Dance.

The annual Electrical Engineers' dance at Manchester takes place on Friday, December 9th, at the Midland Hotel. Tickets may be obtained from any member of the Committee; from the Honorary Secretary, Mr. C. D. Taite, 196, Deansgate, Manchester; or from the Honorary Treasurer, Mr. J. H. Williams, 42, King's House, King Street West, Manchester.

Ferrybridge Power Station.

The directors of the Yorkshire Electric Power Co. are arranging that Ferrybridge power station will be on view for inspection of the first section, which is now completed, on October 18th, 19th and 21st. October 20th and 22nd have been reserved for shareholders. The first section of the station includes two 19,000-kW turbo-generators with the necessary boiler plant and auxiliary machinery. The ultimate capacity of the station will be not less than 180,000 kW. The site is an ideal one for supplying the needs of the West Riding, and the station will form an important link in the national electricity scheme. An exhibition of industrial electrical appliances in operation will be arranged.

Mumbles Railway Electrification.

The Mumbles Railway at Swansea is the oldest existing in the United Kingdom, and probably the oldest in the world, having been incorporated in 1804 and opened in 1807. It has a length of 5¼ miles of single track, with loop lines at each of its intermediate stations, and its present equipment consists of four steam locomotives, 39 passenger coaches of the tramway type, and one goods vehicle. The electrification of the line, which has a heavy passenger service, is being undertaken by the Swansea Improvement and Tramway Co., in conjunction with the Swansea Corporation, through Mr. J. W. Burr, borough electrical engineer. The Swansea Improvement and Tramway Co., to which the operation of the railway is leased, is a subsidiary company of the British Electrical Federation, Ltd. The scheme includes the provision of five trains, each consisting of two 30-ton cars. A 12-minute service is to be maintained, with a scheduled speed of 12 miles per hour and half-minute stops at stations. The line will be operated by direct current, carried by overhead trolley wires at 650 volts. Electricity will be supplied by the Swansea Corporation in the form of alternating current at 6,600 volts, and in order to convert it into direct current a sub-station is to be provided by the Swansea Corporation Electricity Department, at Blackpill, which is about the middle point of the line.

The order for the sub-station equipment, which has been placed with the Metropolitan-Vickers Electrical Co., Ltd., covers the installation of two 500-kW rotary-convertor sets with fully-automatic control gear. Provision is to be made for the installation of a third rotary-convertor set when required. The equipment will include the complete automatic protective gear which is a feature of Metro-Vick automatic control gear. The arrangement of the equipment will be such that the initial impulse of starting the station, when required, will be given by operating a switch on the supply circuit at the generating station. The first rotary convertor at the sub-station will then start automatically and connect its output to the line. The second machine will come into commission whenever the load on the line requires the operation of both machines. Directly the load falls to a value at which it can be carried by one machine alone, the machine last started will be automatically disconnected and stopped. Provision will be made for the two initial sets, and later the three sets, to start in any desired order.

The contract for the new coaches for the electrified line has been placed with the Brush Electrical Engineering Co., Ltd., Loughborough. The rolling stock will comprise eleven coaches of the bogie type, each coach being fitted with B.T.-H. two-motor electrical driving equipments and B.T.-H. air-braking equipment. The control equipment is of the electro-magnetically-operated contactor type. The complete electric equipments for power and braking are now being manufactured by the British Thomson-Houston Co., Ltd., Rugby.

The Institute of Transport.

The new session will open on Monday, October 10th, when Mr. Roger T. Smith, B.Sc., M.I.E.E., will deliver his presidential address. Amongst the papers to be read during the session will be one on "The Southern Railway Electrification," by Mr. E. C. Cox, C.B.E., M.V.O. The meetings will be held at the Institution of Electrical Engineers, at 5.30 p.m., on Mondays, except one on Tuesday, November 22nd, which will commence at 7.45 p.m.

Electricity Supply at Tilbury.

The Tilbury Urban District Council has recently inaugurated an electricity supply, and we are indebted to the consulting engineer, Mr. David A. Evans, for the following particulars of the scheme. A supply of energy is being taken from the County of London Electric Supply Co., Ltd., at 3,300 V, and it is transformed to the standard working pressures at the Council's sub-station in Montreal Road. This station houses at present two transformers with capacities of 312 kVA and 94 kVA, respectively. It is intended to install four 312-kVA transformers in the near future as the load develops, and allowance has been made for this in the building of the sub-station. In the North Ward another sub-station having a capacity of 188 kVA has been built, but has not yet been completed. For the purpose of l.p. distribution the district has been split up into five areas, of which two are now in commission; work is progressing favourably in the other three areas. The street lamps, approximately 300, are controlled by the "Olipell" automatic control system, which is operated entirely from the sub-station. The main contractors are Messrs. Watshams, Ltd., the cables being manufactured by the Hackbridge Cable Co., Ltd. The Metropolitan-Vickers Electrical Co., Ltd., has supplied and erected the whole of the sub-station equipment, with the exception of the automatic control gear for the street lighting, which is being supplied by Oliver Pell Control, Ltd. As the necessary statutory powers were only received by the Council at the beginning of June, something like a record has been created by both the cable-laying contractors and the Metropolitan-Vickers Co.

Since June 4th 36,000 yd. of cable has been laid and jointed by Messrs. Watshams, Ltd. The M.-V. sub-station gear was only delivered on site three weeks before the actual opening of the system, and during that period the company unpacked, erected, and completed the whole of the sub-station equipment two days before the specified date of completion. The Council has a housing estate of 1,672 houses, which it is proposed ultimately to completely electrify with both lighting and cooking; at the moment contracts have been placed for the electrification of 250 of these houses. The whole of the negotiations for the Special Order, the work and specification for the cable network and sub-stations, together with the work in connection with the housing scheme and supervision were carried out by Mr. Evans, in conjunction with Mr. A. W. Buckner and Mr. S. A. Hill-Willis, the clerk and surveyor to the Council, respectively.

The formal inauguration of the undertaking and the switching-on of current took place on September 21st. The ceremony was performed by the chairman of the Council (Councillor J. F. Feenan), in the presence of a company consisting of members of the Tilbury and neighbouring councils, and representatives of the contractors and the Press. The party subsequently met at dinner, when the chairman said that the main contractors (Messrs. Watshams, Ltd.), the Metropolitan-Vickers Electrical Co., Ltd., and the County of London Electric Supply Co. had all done their best to meet the Council's wishes. Their consulting engineer, Mr. D. A. Evans, had displayed remarkable energy and ability, and the result was that they were able to switch on within four months of receiving their Order. He considered this remarkable in connection with a £41,000 contract. Reference was made to the good work done by the Clerk (Mr. A. W. Buckner) and the Surveyor (Mr. Hill-Willis), and the representatives of the contractors, Mr. D. A. Evans, and the officials all spoke. Councillors from adjacent districts extended their congratulations; Councillor Edwards (Grays U.D.C.) gave the Tilbury Council some useful advice, urging them to institute low charges and develop on every hand, when they would find that they had acquired an asset of inestimable value.

Association of Mining Electrical Engineers.

Members of the East of Scotland and Lothians Branch of the Association were recently conducted over the central generating station at the Aitken Pit, belonging to the Fife Coal Co., by Mr. Copping, chief electrical and mechanical engineer. Later, Mr. Copping, in the course of a lecture, expressed the opinion that the day of the engineer in connection with mining had arrived, and in the near future the colliery electrical engineer would have a much better status than at present. The future of mining lay with machinery—particularly electrical. During the last six years the Fife Coal Co. had electrified fourteen collieries. The controversy regarding the relative advantages of steam and electricity for winding still continued, but the great increase in the number of electric winders proved conclusively that the advantage claimed had been substantiated by the reliability and economy established. In proposing a vote of thanks to Mr. Copping, Mr. John Clark, Bowhill, mentioned that he was about to leave them to join another great coal company, the Bolsover, but he hoped he would continue his interest in the Association of which he had been such a valued member.

Our Personal Column.

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.

The Minister of Transport has appointed Major A. H. C. TRENCH, C.I.E., R.E., M.I.E.E., to be an Inspecting Officer of Railways in place of Lieut.-Colonel G. L. HALL, who recently resigned in order to take up another appointment.

Mr. HERBERT NIGEL GRESLEY, C.B.E., M.I.E.E., &c., is the president-elect of the Institution of Locomotive Engineers. He is the chief mechanical engineer to the London and North-Eastern Railway Co.

Brecon Town Council has appointed Mr. ARTHUR PLUCK, chief electrical engineer to the Ogmore and Garw Urban Council, as clerk of the works of the borough electricity scheme.

It is announced that Mr. G. W. JACKSON, a special director of the Barrow works of Vickers, Ltd., and joint commercial director, is retiring from the service of the company, after 25 years. The commercial departments at Barrow will henceforth be in charge of Mr. W. E. PRITCHARD.

Last week Mr. F. G. KELLAWAY, managing director of Marconi's Wireless Telegraph Co., Ltd., and Capt. P. P. ECKERSLEY sailed for New York to attend the World Radio-Telegraph Conference which is to consider amendments to the international regulations. Mr. Kellaway represents the Marconi interests and will be joined later by Senatore Marconi, while Capt. Eckersley is attending on behalf of the B.B.C.

Sir HERBERT MORGAN, K.B.E., of Metro-Vick Supplies, Ltd., has accepted the presidency of the Electrical Trades Commercial Travellers' Association for 1928.

We offer our congratulations to Mr. D. H. BONNELLA (founder of the business of D. H. Bonnella & Son, Ltd.), who celebrated the sixtieth anniversary of his wedding on September 23rd. Mr. Bonnella, who is in his 88th year and enjoys very good health, enabling him to attend at the offices of the company for a few hours daily, was honoured with a letter of congratulation from the King and Queen.

Mr. A. W. SAULTER has been appointed sales superintendent to the Greenwich Cable Works, Ltd.

Mr. F. N. RENDELL-BAKER, of St. Helens, has been appointed borough electrical engineer and manager at Halifax, to succeed the late Mr. W. M. Rogerson. He was previously engaged at the Bolton, Darwen, and Farnworth electricity works. There were 55 applications for the Halifax appointment. Mr. Rendell-Baker became engineer and manager of the St. Helens undertaking in 1921. During his tenure of office there a large scheme of extensions has been carried out, many agreements for bulk supplies have been negotiated, including one for 32,000,000 units; the sales of energy have risen from 13,000,000 to 33,000,000 units per annum, and the net profit has reached £21,800, whilst the cost of production has fallen from 1.19d. to .57d. per unit, and the average price obtained per unit sold from 1.59d. to .85d. In 1922 the coal

Photo by] **Mr. F. N. Rendell-Baker.** *[Lafayette.*

figure was 2.87 lb. per unit generated, and the thermal efficiency was 12 per cent. The figures to-day are 1.8 lb. coal per unit generated, and thermal efficiency 18.5 per cent.

Mr. A. S. WRAIGHT, who has joined the board of the Holland House Electrical Co., Ltd., of St. Vincent Street, Glasgow, takes up his duties on October 1st.

Obituary.—LORD GEORGE HAMILTON.—Lord George Hamilton, who passed away on September 22nd, at the age of 82 years, was deputy chairman of the Central London Railway, and a director of the Metropolitan District Railway Co. and Underground Electric Railways Co. of London, Ltd.

Wills.—The late Mr. ARNOLD F. HILLS, of Thames Ironworks fame, left £60,496 gross and £135 net personalty.

Mr. A. G. M. JACK, late deputy chairman of Messrs. Hadfields, Ltd., left £106,527 net and £108,540 gross personalty.

Financial Section.

New Companies, Returns of Share Capital, Debenture Changes, Reports of Electrical Companies, Dividend Results, Transactions in Stocks and Shares.

New Companies Registered.

Frederick Victor, Ltd.—Private company. Registered September 21st. Capital, £500 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in electrical and wireless goods, cycles, gramophones, electric light and general electrical engineering tools, &c. The subscribers (each with one share) are:—Helen McGuinness, 46, Constantine Road, Hampstead, private secretary; Vivienne Harrison, 61, Lewin Road, S.W.16; clerk. Secretary (*pro tem.*): — Bowers. Registered office: 20, Old Haymarket, Liverpool.

Richard France, Ltd.—Private company. Registered September 22nd. Capital, £3,000 in £1 shares. Objects: To acquire the business of a brass and aluminium founder now carried on by R. France at Peterborough, and to carry on the business of electrical, mechanical, agricultural and general engineers, &c. The directors are:—R. France (managing director), 11, Windmill Street, Peterborough; J. P. Eristow, address not stated; H. Cleminson, 118, Upper Lloyd Street, Greenheys, Manchester; F. Hulland, and C. Steers, addresses not stated. Solicitors: Wyman & Abbott, Peterborough.

Northants Electrical Installations, Ltd.—Private company. Registered September 22nd. Capital, £2,000 in £1 shares. Objects: To acquire the business of electrical, wireless, and refrigerating engineers carried on by L. L. Neaverson and S. H. Skipper at Peterborough, as the "Northamptonshire Electric and Wireless Company." The permanent directors are:—L. L. Neaverson, "Wooddarra," Park Road, Peterborough, radio engineer; S. H. Skipper, 343, Gladstone Street, Peterborough, refrigerating engineer (managing director). Solicitors: Williams & Co., 43, Westgate, Peterborough.

Merchant Manufacturers Co., Ltd.—Private company. Registered September 22nd. Capital, £1,000 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in radio apparatus and component parts thereof, electrical engineers, &c The first directors are:—L. Lewis, 54, Pursers Cross Road, S.W.6, mortgage broker; A. James, Bracondale, near Gravesend, engineer; Esther Lewis, 50, Pursers Cross Road, S.W.6. Secretary: A. James. Registered office: 20, Bartletts Buildings, Holborn Circus, E.C.1.

G. C. Aimer & Co., Ltd.—Private company. Registered September 21st. Capital, £4,000 in £1 shares. Objects: To carry on the business of manufacturers, exporters, importers and repairers of, agents for and dealers in surgical, electro-medical, X-ray, ultra-violet ray instruments and appliances, glass blowing and manufacturing hospital suppliers, chemists, druggists, &c. The directors are:—G. C. Aimer, "Waveney," Tunnel Wood, Ridge Lane, Watford, electromedical apparatus manufacturer; H. Cachemaille, 45c, Courtfield Gardens, South Kensington, S.W.5, engineer. Registered office: 740, High Road, Tottenham, N.17.

Sydney S. Bird & Sons, Ltd.—Private company. Registered September 22nd. Capital, £2,500 in £1 shares. Objects: To acquire the business carried on at Cyldon Works, Sarnesfield Road, Enfield Town, or elsewhere, as Sydney S. Bird and Sons, to adopt an agreement with S. S. Bird, and to carry on the business of electrical and mechanical engineers in all its branches. The subscribers (each with one share) are:—Ena Scott, 380, Monega Road, Manor Park, E.12, clerk; H. T. Page, 5, Higham Road, Bruce Grove, N.15, clerk. The permanent directors are: S. S. Bird and Ida M. Bird. Solicitors: Kenneth Brown, Baker, Baker, Lennox House, Norfolk Street, Strand, W.C.2.

"Quint" Tubes, Ltd.—Private company. Registered September 17th. Capital, £100 in £1 shares. Objects: To acquire the business of the "Quint" Earthing Tube Syndicate for the manufacture of the "Quint" earthing tubes, and to carry on the business of manufacturers of metallic and other tubes, &c. The subscribers (each with one share) are:—Amy L. Moulter, 19-20, Cousin Lane, E.C.4, clerk; E. Howard, 19-20, Cousin Lane, E.C.4, secretary. B. Quint is a first director, 19-20, Cousin Lane, E.C.

Beam, Ltd.—Private company. Registered September 17th. Capital, £5,000 in £1 shares. Objects: To acquire from A. Lester and C. Marquis, the registered proprietors of the trade name "Beam," 468,704 in Class 8, as applied to electric batteries (not medical), loud speakers, &c. The first directors are:—W. Garrard, 100, Queen's Gate, S.W.7; A. Lester, 56, Fairholm Road, W.14; C. Marquis, 35, Armitage Road, Golders Green, N.W.11. Registered office: 16, Thavies Inn, E.C.1.

Official Returns of Electrical Companies.

Tangent Tool Engineering Co., Ltd.—Debenture dated September 5th, 1927, to secure £500, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: M. Freeman, Portland House, Basinghall Street, E.C.2.

Jesmond Electrical and General Engineering Co., Ltd.—E. Macartney, C.A., of 1, Eldon Square, Newcastle-upon-Tyne, was appointed receiver on September 12th, 1927, under powers contained in debenture dated December 7th, 1921.

W. J. Furse & Co., Ltd.—Capital, £35,000 in 9,000 preference and 26,000 ordinary shares of £1 each. Return dated May 21st, 1927. 9,000 preference and 21,029 ordinary shares taken up. £10,735 paid on 10,735 ordinary shares. £19,294 considered as paid on 9,000 preference and 10,294 ordinary shares. Mortgages and charges nil.

Northwood Electric Light and Power Co., Ltd.—Capital, £60,000 in 15,000 preference and 45,000 ordinary shares of £1 each. Return dated April 14th, 1927. 6,880 preference and 32,307 ordinary shares taken up. £34,962 paid on 28,082 ordinary and 6,880 preference shares. £4,225 considered as paid on 4,225 ordinary shares. Mortgages and charges £30,000.

Erskine, Heap & Co., Ltd.—Capital, £50,000 in £1 shares. Return dated April 7th, 1927. 45,489 shares taken up. £7,826 paid. £37,663 considered as paid. Mortgages and charges nil.

P. R. Jackson & Co., Ltd.—Capital, £60,000 in £1 shares. Return dated April 14th, 1927. All shares taken up. £17,110 paid (being £1 per share on 11,410 shares and 6s. per share on 19,000 shares). £42,890 considered as paid (being £1 per share on 29,590 shares and 14s. per share on 19,000 shares). Mortgages and charges nil.

Paignton Electric Light and Power Co., Ltd.—Capital, £40,000 in £1 shares. Return dated April 5th, 1927. All shares taken up. £40,000 paid. Mortgages and charges nil.

Electrical Distribution of Yorkshire, Ltd. — Capital, £1,000,000 in £1 shares. Return dated March 15th, 1927. 500,000 shares taken up. £500,000 paid. Mortgages and charges nil. Return of allotments, made up to April 5th, 1927, shows a further 300,000 shares allotted for cash, £1 per share, with a premium of 5s. per share, being due and payable on each.

Wycombe Borough Electric Light and Power Co., Ltd.—Capital, £125,000 in 5,000 preference and 20,000 ordinary shares of £5 each (since subdivided into £1 shares, and capital increased to £150,000 in 25,000 preference and 125,000 ordinary shares of £1 each). Return dated April 26th, 1927. 3,000 preference and 18,000 ordinary shares taken up. £105,000 paid. Mortgages and charges £40,000. Return of allotments, made up to April 29th, 1927, shows a further 18,000 ordinary shares of £1 each allotted as fully paid, being capitalisation of part of reserves.

Direct Spanish Telegraph Co., Ltd.—Capital, £95,000 in 6,000 preference and 13,000 ordinary shares of £5 each. Return dated May 17th, 1927. 12,931 ordinary and 6,000 preference shares taken up. £94,655 paid. Mortgages and charges, £96,000 4½ per cent. debentures.

Lancashire Electric Light and Power Co., Ltd.—Capital, £2,571,415 in 571,415 first preference, 1,000,000 7 per cent. preference, and 1,000,000 ordinary shares of £1 each. Return dated June 6th, 1927. 511,440 first preference, 1,000,000 7 per cent. preference, and 1,000,000 ordinary shares taken up. £2,509,040 paid. £2,400 considered as paid. Mortgages and charges nil.

Weldrics (1922), Ltd.—Capital, £25,000 in £1 shares. Return dated April 12th, 1927. 15,500 shares taken up. £13,925 paid. £1,500 considered as paid. £75 in arrears. Mortgages and charges nil.

Greenwich Cable Works, Ltd.—Capital £108,661 in 35,000 first preference, 25,000 second preference, 14,100 third preference, and 34,561 ordinary shares of £1 each. Return dated June 29th, 1927. 34,527 ordinary, 35,000 first, 25,000 second, and 14,100 third preference shares taken up. £35,000 paid. £73,627 considered as paid. Mortgages and charges nil.

Solidite and Synthetic Mouldings, Ltd.—Particulars filed of £5,000 debentures authorised July 14th, 1927, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £3,600.

Symondsbury Electric Lighting Co., Ltd.—Capital, £2,000 in £5 shares. Return dated May 7th, 1927. 244 shares taken up. £1,220 paid. Mortgages and charges nil.

Banbury and District Electric Supply Co., Ltd.—Capital, £25,000 in £10 shares. Return dated June 13th, 1927. All shares taken up. £25,000 paid. Mortgages and charges £4,200.

Ellis & Ward, Ltd.—Capital, £10,000 in 2,000 preference and 8,000 ordinary shares of £1 each. Return dated May 23rd, 1927. 1,000 preference and 6,003 ordinary shares taken up. £1,003 paid on 1,000 preference and 3 ordinary shares. £6,000 considered as paid on 6,000 ordinary shares. Mortgages and charges nil.

Wireless Apparatus, Ltd.—Capital, £2,000 in 1,000 "A" shares of £1 each and 8,000 "B" shares of 2s. 6d. each. Return dated September 1st, 1927. 100 "A" and 4,000 "B" shares taken up. £500 paid. £100 calls unpaid. Mortgages and charges nil.

City Notes.

Canadian Marconi Co.

The purchase of the majority of the shares of the Canadian Marconi Co. is announced by Messrs. Lazard Bros. & Co., of London. The shares are being transferred to a holding company in which Marconi's Wireless Telegraph Co., Ltd., and the Radio Corporation of America have taken substantial participation. The Lazard firm will, it is understood, control the holding company and, in order to ensure the control remaining permanently British, are forming a voting trust for 25 years. This trust holding voting control in the holding company will be vested in three trustees, two of whom are nominated by Lazards and one by the British Marconi Company. The first trustees will be Sir Robert Kindersley, Mr. R. H. Brand, and either Lord Inverforth or

Mr. F. G. Kellaway. It is further announced that Sir Joseph Flavelle, chairman of the Canadian Bank of Commerce, has agreed to become chairman of the Canadian Marconi Co.—*Reuter* (Montreal).

Stock Exchange Notices.

Dealings in the following have been specially allowed by the Committee under Rule 159:—

International Telephone and Telegraph Corporation.—New capital stock in 116,400 shares of $100 each, fully paid.

Application has been made to the Committee to allow the following to be officially quoted:—

Midland Counties Electric Supply Co., Ltd.—250,000 6 per cent. cumulative preference shares of £1 each, fully paid, Nos. 1,250,000 to 1,500,000.

Smith (S.) and Sons (Motor Accessories), Ltd.—400,000 7½ per cent. cumulative preference shares of £1 each, fully paid, Nos. 1 to 400,000.

Halifax and Bermudas Cable Co., Ltd.

The report for the year ended June 30th last states that the net result of working was a profit of £26,949, as compared with £28,322 in 1925-26. To this is added £62,554 brought forward, making £89,503. After deducting the interim dividend and £2,420 for repairs, there is a balance of £84,583. From this a final dividend of 5 per cent., free of tax, making 10 per cent., tax free, for the year, is to be paid, leaving £82,083 to be carried forward. The annual meeting was held on September 22nd.

West India and Panama Telegraph Co., Ltd.

The expenses for the year ended December 31st, 1926, exceeded the revenue by £1,383, and after providing for debenture interest, depreciation, &c., the deficit was increased to £10,267. This was added to the accumulated deficit brought forward, bringing the total to £121,338. The first and second preference dividends are paid up to June, 1919, but the ordinary shares have received nothing since 1918, when ½ per cent., free of tax, was distributed.

Worcester Electric Traction Co., Ltd.

The total revenue for 1926 was £26,161, and the profit £4,640. The addition of the balance brought forward makes available £8,276. The reserve receives £1,000 and a dividend of 5 per cent. is paid on the ordinary shares (against 3 per cent.), leaving £2,506 to be carried forward. Negotiations are proceeding for the sale of the undertaking to the Worcester Corporation.

Para Telephone Co., Ltd.

The profit for the past year amounted to £8,209 (against £4,570 in 1925). Adding the balance brought forward, the amount available is £12,133. Depreciation absorbs £4,038; a dividend of 3 per cent. is being paid (as in 1925); and £5,995 is carried forward.

Folkestone Electricity Supply Co., Ltd.

A half-yearly dividend at the rate of 8 per cent. per annum has been declared on the ordinary shares (as against 7 per cent. in 1926).

Ransome & Marles Bearing Co., Ltd.

The directors have declared a dividend of 7½ per cent. out of profits of £38,064 for 1926-27. During the year the debenture debt was reduced by £21,000

Shropshire, Worcestershire, and Staffordshire Electric Power Co.

An interim dividend on the "A" ordinary shares of 4 per cent. (actual), less tax, has been declared.

Northern General Transport Co., Ltd.

An interim dividend of 2½ per cent. (actual) has been declared on the ordinary shares, as last year.

Montreal Light, Heat and Power Consolidated.

A dividend of $0.5 per common share has been declared for the quarter ending September 30th.

Hopkinsons, Ltd.

An interim dividend of 1s. per share has been declared on the ordinary shares, as in 1926.

Bruce Peebles & Co., Ltd.

A dividend at the rate of 7½ per cent. per annum has been declared on the cumulative participating preference shares.

Shanghai Electric Construction Co., Ltd.

An interim dividend of 4 per cent. has been declared.

German Companies.

The *Isaria Meter Co.*, Munich, proposes to reduce its share capital by 440,000 marks to 1,760,000 marks. In the year 1925-26 the accounts showed net profits of 19,700 marks.

The *Electricity Industry Company*, Hamburg, reports a satisfactory development of the undertaking in 1926-27, and a favourable outlook for the current year. A dividend of 6 per cent. has been declared out of the surplus of 489,000 marks for 1926-27.

The *Electricity Company (late W. Lahmeyer & Co.)*, Frankfort, reports net profits of 2,010,000 marks for 1926-27, as against 1,880,000 marks in the previous year. It is proposed to increase the dividend from 9 per cent. to 10 per cent. The company has raised a 6 per cent. loan of 15,000,000 Swiss francs to strengthen the working funds and to carry out developments.

Swiss Companies.

The *Motor Columbus Company for Electrical Undertakings*, Baden, is paying a dividend of 10 per cent. for 1926 on the increased capital of 75,000,000 fr.; the same rate was paid on a capital of 60,000,000 fr. in the previous year.

The *Bank for Electrical Undertakings*, Zurich, reports that the net profit increased from 5,634,000 fr. in 1925 to 6,397,000 fr. last year; it is proposed to increase the dividend from 9 to 10 per cent. The share capital is to be increased from 51,500,000 fr. to 75,000,000 fr. by the issue of new shares at the price of 120 per cent. or 600 fr. per share.

Norwegian Company.

The *Norsk Hydroelektrisk Kvælstof Co.* is negotiating a loan of $20,000,000 in New York, the proceeds of which will be used for the modernisation of the company's plant and to strengthen its financial position.

Swedish Company.

L. M. Ericsson Telephone Co.—The company has arranged a loan of 20 million kroner from four large Stockholm banks. A part of this is required to repay expiring loans and the remainder will be used for development purposes.

Stocks and Shares.

MONDAY EVENING.

THE main feature in electrical stocks and shares, during the past business week, has been in Mexican utility issues. It is a little singular that Mexican Government, railway, and similar descriptions should have been hardly affected at the time when the bonds and shares of electric light and tramway companies were so greatly in request. The Washington Government has appointed as American Ambassador to Mexico a partner of the famous banking house of J. P. Morgan & Co. This was interpreted as a bull point for Mexican industrials. Following upon the material rises scored in the previous week, fresh gains took place in Mexican Light and Power, and in Mexico Tramways. Opposition to the appointment was said to be rising in the States, and the gains in utility prices were not fully held. However, Mexican Light and Power common are 11½ higher on the week at 62½, and the first mortgage fives show a 5 points jump to 79½. Mexican Electric Light 5 per cent. first mortgage bonds rose to 71½. In Mexico Tramways common shares a lively business is in progress. The price went up to nearly 30 before reacting to 27½. The 6 per cent. 50-year mortgage bonds are harder at 70.

South Americans.

Brazilian Tractions paused to take breath after their violent ascent, and the profit-taker promptly appeared upon the scene. The price receded a few dollars to 196. The reaction, measured against the previous rise in price, is hardly worth mentioning, especially as there was a sharp recovery to 199. At 164 the preferred are practically unchanged, after a dip to 162. Rio Trams first mortgage 5 per cent. gold bonds change hands fairly constantly at 99. The company's 5 per cent. 50-year mortgage gold bonds are quoted about 89½. Sao Paulo Tramway 5 per cent. first mortgage debentures stand at 103, and the company's 5 per cent. perpetual consolidated debenture stock at 84½. Manaos Trams 7 per cent. non-cumulative income first debenture is 50 to 53. The stock received 3½ per cent. last November, and has had nothing since. The £1 shares are a somewhat nominal market at a florin or thereabouts. Buenos Aires Lacroze 5 per cent. debenture hardened to 73½.

Anglo-Argentine Tramways first preference have strengthened to 3½, for the reassuring reasons mentioned here last week. The company's other shares and stock are unchanged. British Columbia deferred continues to be in demand: the price is up 4, at 169½. A smaller gain lifted the preferred to 134½.

The Last "Marks."

Amongst other tramway and kindred shares it may be of interest to set out a brief list showing the current prices, and, when the market is very limited, the last dates upon which shares were negotiated in the Stock Exchange. A representative group is as follows:—

Stock or Share.	Price.	Last mark.
Bath Electric Trams, pfd., ord.	4/6	4/4½ (15/6/27)
Colombo Electric Trams, 1st deb. ...	102½	89 (1/2/27)
Hastings Electric Trams, ord.	1/9	1/3 (8/7/27)
Havana Electric Railway, 5%	98½	99 (7/3/27)
Kalgoorlie Electric Trams, A deb. ...	45½	46 (13/1/26)
Lanarkshire Trams	1/6	1/- (18/5/27)
Lisbon 6 p.c. pref.	15/-	14/9 (26/7/27)

Stock or Share.	Price.	Last mark.
Llandudno & Colwyn Bay Electric Railway	1/6	1/1 (20/6/27)
Manx Electric 5½ pref.	3	63/9 (20/10/26)
Pernambuco 8 p.c. p. lien.	98	101½ (21/2/27)
Potteries Electric Trams, ord.	2/6	1/9 (18/8/27)
,, ,, ,, pref.	4/6	3/9 (18/8/27)
Shanghai Electric Con.	17/8	38/- (27/7/27)
Singapore Traction, ord.	10/-	10/6 (6/9/27)
South Met. Electric Trams, 4 p.c. deb. ...	64	67½ (3/5/27)
Torquay Trams, ord.	23/9	24/- (23/5/27)
Yorkshire West R., pref.	13/9	13/6 (31/8/27)

London Transport.

London United Tramways preference are being dealt in on the basis of 8s. 6d. The ordinary were bought at 1s. 9d. a few days ago. London and Suburban Traction preference attract a little notice around 9s. 6d., the ordinary remaining at 3s. On the former shares no dividend has been paid since March, 1924. The Home Railway stocks are quiet. Districts have gone back to 61¼. Underground Electric 6 per cent. income bonds gained a point at 103, and the £1 rose 6d. to 19s. The Tube Trade Facilities Act 4½ per cent. second debentures hold their advance to 94. In the T.F.A. group, Perak River Hydro-Electric Power 5 per cent. guaranteed stock has advanced to 101½.

Provincial Electrics.

Amongst home electricity companies the feature is the manner in which prices of the provincial companies' shares are moving up. Clyde Valleys have risen 2s., Midland Counties are a better market than the current price suggests. Lancashire Electrics are again 6d. higher at 31s. 6d. The pressure to buy the shares is fairly constant, and by degrees the floating supply of stock is diminishing. It is none too easy to get anything like a line of good shares in this section, while in regard to the London companies' ordinary, the holders retain their shares with tenacity, refusing to be allured into sales by the speculative fever which lends glamour to other industrials. There are no changes in the list of ordinary shares, but Urban ordinary continue to mount, and at 31s. 3d. are 1/16 better on the week. Electric Supply Corporation are up to 32s. 6d. The near approach of Greenwich time resumption is not a factor, yet, in the illumination markets.

The Cable Depression.

The market for cable stocks and shares is rallying from its recent depression. The fall in the Eastern quartette served to bring in a few buyers, and Eastern ordinary stock has recovered to 173½, though Eastern Extensions and Westerns remain on the dull side. Globe ordinary are ⅛ down at 18. Great Northern Telegraphs put on 25s. at 31½, some of the support coming from Copenhagen. While cable stocks are steadier, the wireless group is somewhat depressed, Marconis going back to 20s. The denomination is still £1 per share, the writing-off process not having yet been accomplished. When it is, no difference will be made in the market quotation on this account. In the case of Vickers, the immediate effect of the writing-down was to raise the price of the shares, but this was due to circumstances that are scarcely likely to operate in the case of Marconis. The rumours are denied which linked Vickers with Armstrongs. Mr. F. G. Kellaway, managing director of the Marconi Co., is on his way to attend the World Radio Conference to be held at Washington next week.

Equipment Shares.

Manufacturing shares are dull, with falls in British Aluminium ordinary, Brush, Johnson & Phillips, and Siemens. There is no other reason for the reaction, so far as can be ascertained, than that prices were run up rather ambitiously in the previous advance, and that, with other shares claiming popular attention more insistently, holders of the electrical and cable manufacturing descriptions elected to sell these and to put the money into frank speculations. British Insulated drooped to 3¾; an interim dividend of 5 per cent. has been declared. This is the same as that of a year ago. International Automatic Telephones gave way to 42s. 3d., and Telephone Manufacturing to 6s. 10½d. Telegraph Constructions make an exception to the general rule, rising £1 to 28½. At this price the yield on the money is £4 4s. 4d. per cent.; the dividends are paid free of tax. English Electrics have picked up to 11s. 3d., while the preference hold their gain of last week at 13s. 9d.

Miscellaneous Movements.

Amongst other changes on the week may be mentioned rises to 44s. 4½d. in Calcutta Electric Supply ordinary, and to 22s. in Isle of Thanet Electric 6 per cent. preference. British Automobile Traction 8 per cent. participating preference at 25s. are 1s. up, and ex rights. Rubber shares lean to the lower side. The price of the raw material went a little better upon the circulation of rumours that more drastic restriction of production is contemplated, with a re-assessment of the exportable allowances upon all the estates that subscribe to the Stevenson scheme. But the gossip has not been substantiated, and prices lost most of the brightness with which the rumour transiently invested them.

Share List of Electrical Companies.

HOME ELECTRICITY COMPANIES.

	Nom.	Dividend. 1925.	Dividend. 1926.	Price Sept. 26 1927.	Rise or fall.	Yield. p.c.
	£					
Bournemouth and Poole	1	14	14	58/3	+	4 15 9
Brompton Ordinary	1	10	8½	24/6	—	5 14 3
Charing Cross Ordinary	1	15	8½	25/6	—	5 9 10
do. do. 4½ Pref. ...	1	4½	4½	17/6	—	5 2 10
Chelsea	1	12	8¾	24/6	—	5 14 8
City of London	1	15	7½	29/3	—	4 15 9
do. do. 6% Pref.	1	6	6	22/6	—	5 6 8
Clyde Valley	1	8	8	32/6	+2/-	4 18 6
County of London	1	15	7½	27/6	—	5 1 1
do. do. 6% Pref.	1	6	6	22/6	—	5 6 8
Edmundson's Ordinary	1	8	10	37/6	—	5 6 8
do. 7% Pref.	1	6	7	24/6	—	5 14 8
Elec. Supply Corporation	1	10	10	32/6	+6d.	6 3 0
Kensington Ordinary	1	15	8	25/6	—	5 9 10
Lancs. Light and Power	1	7½	7½	26/6	—	5 13 8
London Electric	1	10	8½	24/6	—	5 14 3
do. do. 6% Pref.	1	6	6	5⅝	—	5 11 3
Metropolitan	1	11	8	30/-	—	4 13 4
do. 4½% Pref.	1	4½	4½	17/-	—	5 8 6
Midland Counties	1	5½	6	21/6	—	5 11 7
Newcastle-on-Tyne Ordinary ...	1	7	5	22/-	—	4 11 0
do. 5% Pref. ...	1	5	5	17/6	—	5 14 8
do. 7% Pref. ...	1	7	7	25/-	—	5 12 0
Notting Hill 6% Pref.	10	6	6	10⅝	—	5 11 7
North Met. Elec. 6% Pref. ...	1	6	6	22/-	—	5 9 1
St. James' and Pall Mall	5	17½	8	25/6	—	5 9 10
South London	1	15	8½	25/-	—	5 12 0
South Metropolitan Pref.	1	7	7	1¼	—	6 3 0
Urban Ordinary	1	7	7	1 1/16	+ 1/16	4 9 7
do. 6% Pref.	1	6	6	1 1/16	—	5 18 0
Westminster Ordinary	1	15	8½	25/-	—	5 12 0
Whitehall Elec. Invst. 7½% Pref. ...	1	7½	7½	21/3	—	7 1 2
Yorkshire Elec.	1	8	8	31/6	+6d.	5 3 0

HOME RAILS.

Central London Ord. Assented ...	Stock	4	4	70	—	5 14 4
Metropolitan	,,	5	5	56½	—	5 6 3
do. District	,,	3½	3½	61½	—½	5 13 10
Underground Electric	£1	Nil	1½	19/-	+6d.	1 11 7
do. do. Income ...	Bonds	6	6	103	+1	*5 16 6

TELEGRAPHS AND TELEPHONES.

Anglo-Am. Tel. Pref.	Stock	6	6	108	—	5 16 6
do. Def.	,,	1½	1½	25	—	6 0 0
Automatic Telephone	1	8	10	49/6	—	4 1 0
Chili Telephone	5	5	6	7⅜	—	3 18 3
Eastern Extension	10	10	10	17½	—	*5 14 3
Eastern Tel. Ord.	Stock	10	10	173½	+1	*5 15 3
Globe Tel. and T. Ord.	10	10	10	18	—½	*5 11 1
do. do. Pref.	10	6	6	11	—	5 8 1
Great Northern Tel.	10	20	20	31½	+1½	6 6 0
Indo-European	25	8½	10	44½	—	*5 7 6
Marconi	1	Nil	Nil	1	—1/16	... ...
Marconi-Marine	1	7½	8½	28/9	—	6 1 9
Oriental Telephone Ord.	1	12	12	52/6	—	*4 9 4
United R. Plate Tel.	5	8	8	10	—	*4 0 0
Western Telegraph	10	10	10	17½	—	*5 14 3

HOME AND FOREIGN TRAMS, &c.

Anglo-Arg. Trams First Pref. ...	5	5½	5½	2⅛	+1/16	7 17 2
do. do. 2nd Pref. ...	5	6	6	8 1/16	—	8 14 6
do. do. 5% Deb. ...	Stock	5	5	73½	—	6 16 1
British Electric Traction Def. Ord.	,,	8	8	800	—	... ...
do. do. 8% Pref. Ord.	,,	6	8	121½	+1	6 11 10
Brazil Traction	100	5	6	199	—3½	3 0 3
Brit. Columbia Elec. Rly. Pcs. ...	Stock	5	5	90½	—	5 10 6
do. do. Preferred ...		6½	6½	134½	+2	4 13 0
do. do. Deferred ...	,,	8	8	169½	+4½	*4 14 5
do. do. Deb. ...	,,	4½	4½	80½	—	5 5 7
London & Sub. Trac. 5% Pref. ...	1	Nil	Nil	10/-	—	Nil
London United Tram. Deb. ...	Stock	4	4	56½	—	7 1
Mexico Trams, 5% Bonds	—	5	5	74	+2	6 15 2
Mexican Light Common	100	Nil	Nil	62½	+11½	Nil
do. Pref.	100	Nil	Nil	80½	+3	Nil
do. 1st Bonds	—	5	5	79½	+5	6 5 9
Yorkshire (West Riding)	1	5	—	7/6	—	... ...

MANUFACTURING COMPANIES.

Babcock & Wilcox		18	18	53/9	—1/16	4 16 8
British Aluminium Ord.	1	12½	10	47/0	—6d.	4 5 1
British Elec. Transformer Pref. ...	1	Nil	7	18/3	—	7 13 6
British Insulated Ord.	1	15	15	3¾	—⅛	4 0 0
Brush Ord.	1	10	10	27/6	—6d.	7 5 0
Callenders	1	15	15	3⅜	—	4 9 9
do. 6½% Pref.	1	6½	6½	23/9	—	5 9 8
Crompton Parkinson Pref. Ord. ...	1	Nil	Nil	16/-	—	... ...
Edison-Swan	4/-	10	10	10/-	—	4 0 0
do. 5% Deb.	Stock	5	5	88	—	5 13 8
Electric Construction	1	10	7½	28/9	—	5 4 4
Enfield Cable Pref.	1	7½	7½	25/-	—	6 0 0
English Electric	1	Nil	Nil	11/3	+ 1/16	... ...
do. do. Pref.	1	8	—	18/9	—	... ...
Gen. Elec. Pref.	1	6½	6½	28/6	—	5 10 8
do. Ord.	1	7½	7½	32/	—	4 13 9
Henley	1	20	25	4 1/16	—	5 1 3
do. 4½% Pref.	5	4½	4½	4½	—	5 6 0
India-Rubber	1	5	5	20/6	—	*4 17 7
Johnson & Phillips	1	17½	12½	50/-	—	5 0 0
Met.-Vickers Ord.	1	8	8	28/9	—6d.	5 11 5
do. Pref.	2	8	8	2⅝	—	6 4 8
Siemens Ord.	1	7	7½	32/6	—½	4 12 4
Telegraph Construction	12	10	10	28½	+1	*4 4 4

* Dividends paid free of Income Tax.

The British Association.—IV.

The 97th Annual Meeting, at Leeds.

The Mechanical Strength of Metal-Filament Electric Lamps.

By F. MURGATROYD, M.Sc.Tech., A.M.I.E.E.

(Abstract of a Paper read before Section G.—Engineering.)

It was stated at the outset that this paper dealt with the subject from the user's point of view, many of the statements made being supported by experimental evidence. The author commenced by showing that in aiming at high efficiency, high temperatures or selective substances were employed. The former method was more effective, and consequently there had been a search for a filament material having a high melting point. Tungsten had proved the best obtainable so far, but the rapidity of evaporation in a vacuum had led to the use of inert gases. To limit the loss of heat through the gas the spiral form of filament had been adopted; that form was essential in gasfilled lamps, but not suitable in a vacuum. To overcome the failure of lamps due to shock and vibration, various expedients had been employed; none of those was completely satisfactory and it should be the aim to produce a lamp sufficiently robust to withstand shock and vibration. After a study of grain growth and grain size, the conclusion was arrived at that filament strength was primarily determined by the size, actual shape and orientation of the crystals. Means of preventing crystal change should be adopted, and for that reason it would appear desirable to use large crystals, although, owing to intra-crystalline weakness, added strength might not necessarily result. In gently-applied continued stress, fracture was liable to occur in large crystals, or, at any rate, in those that occupied the whole cross-section of the wire. If tensile stress was violently applied, the filament would be expected to behave as other metals, and fracture purely as the result of the intensity of the stress. Vibration was much more weakening than continuous stress. Its main effect was to produce fatigue, rendering the metal more readily breakable. Vibration might bring about a modification in crystal orientation, or aid in grain growth, and temperature and the initial grain size might affect that action. It might be found that after many cycles of heating and cooling, the crystal structure was modified in some way. Experiments by F. S. Goucher indicated that both temperature and load acted in the direction of weakness of a tungsten wire, and that was confirmed by practical tests carried out with an automatic shock machine devised for the purpose. Those tests led to the theory that a filament with good physical properties would result in a strong lamp, whether the arrangement was squirrel-cage or fan-shaped, and whether the wire was straight or spiral. Further tests showed that the gas in a lamp did not add to the shock resistance to any appreciable extent; and that both squirrel-cage and spiral-filament lamps were distinctly weaker when burning than when cold. Although gasfilled lamps proved stronger, it was decided that that was not due to the gas but probably to a difference in filament structure. Since high temperature tended to weaken a lamp, it might be thought desirable to work at a lower temperature. That was a retrograde step, however, and users should be able to insist on higher strength in all lamps without resorting to uneconomical operation. Spiral filaments were proved to be no stronger than straight ones, and, moreover, they had a tendency to sag. The addition of thoria had had the effect of limiting that tendency, but it had not yet been overcome. Until it was remedied the straight filament had much in its favour, particularly for lamps below 60 W. The main objection to the squirrel-cage filament was the tendency, under vibration and shock, for adjacent lengths to touch and weld. That might be met by altering the mounting to give a greater distance between lengths or a smaller distance between the top and bottom supports. For low-consumption lamps, especially traction types, the squat squirrel-cage filament had distinct advantages.

In conclusion, it was suggested that advantages might accrue to both the large user and the manufacturer by indicating on the lamp bulb the type of filament used. A method of symbols could be adopted similar to that which worked successfully in the carbon-brush industry. Different types of filaments would be indicated by different symbols, slight variations being marked by suitable additions to the parent symbol.

Discussion.

In the ensuing discussion, Prof. E. W. MARCHANT said that the most interesting thing in the paper was the statement (new to him) that filaments were stronger when they were cold. Regarding the tests, generally, Prof. Marchant said that the cost of electricity for lighting now was so small that it did not pay to discard a lamp and buy a new one. Years ago the number of hours which it was economical to run a lamp for was often worked out and the lamp was abandoned after 800 or 900 hours. Now, however, it paid to run a lamp longer because one could afford to waste energy.

Prof. W. CRAMP said that a point which was not brought out clearly in the paper was the effect of the length of the filament either in total or from support to support, and a little more information on that subject would be useful. The point was that a filament had to be long on account of the high voltage; therefore it was wound into a spiral. It seemed to him that the life of the lamp from the point of view of mechanical strength would depend quite as much on the proper spacing of the supports as on the other factors considered in the paper. The squirrel-cage type of filament was referred to as one which ought to be developed, but it was not sufficient to say that the lamp should be of the squirrel-cage type without going more into the angular distance from support to support around the squirrel-cage and matters of that kind. Referring to the metals from which lamp filaments were made, Prof. Cramp said he assumed that pure tungsten was the best material and he would like to know whether alloys mentioned by the author had been given up, as it appeared they had not been altogether successful. He had found the longest life in tantalum lamps, some of them being still burning after 11 years' constant use.

Dr. SMITH ROSE asked as to the effect of voltage on the life of lamps. A paper read last year at the Institution of Electrical Engineers suggested the use of lamps of a higher voltage than that of the electricity supply in order to get a longer life.

Prof. G. W. O. HOWE (who was in the chair) said that he, also, had been under the impression that filaments were stronger when hot than when cold. Temperature fluctuations were an important factor. In his district (Glasgow) the supply had been changed over to 25-cycle a.c. in some parts, and the fluctuations in the light were "perfectly appalling." It suggested the necessity for going back to carbon-filament lamps.

Mr. MURGATROYD, in his reply, said it could confidently be stated now that lamp filaments were weaker under vibration when hot than when cold, but it was the existence of the contrary opinion that had led to so much attention being given to the matter. In reply to Prof. Cramp regarding the question of supports, he pointed out that he had stated that he preferred the squirrel-cage type for traction lamps, and on board ship and in places where there was vibration, and he also preferred that construction for low-consumption lamps. For high-consumption lamps it was necessary to spiralise the filament owing to the length of wire. At the same time, he did not think that manufacturers had exhausted the methods of mounting filaments; one method he would suggest was to have two squirrel cages instead of one, which would allow much more wire to be used. It might be said that each supporting point introduced a cold spot and reduced efficiency, but the difference in efficiency would not be very great. The alloys mentioned in the paper had been added to tungsten with the object of getting a certain crystalline structure. He held the view that there should be no limit to the life of a lamp, neither would he put any limit to the extent to which the price of lamps should be decreased.

A Thermionic-Valve Type Close Voltage Regulator.

By F. C. TURNER, M.Eng., A.M.I.E.E.

(Abstract of a Paper read in Section G.—Engineering.)

This paper describes a method of automatically maintaining the voltage of a generator steady within close limits over long periods. A generator used for supplying electric furnaces was designed for a full-load output, 15 kW, at from 60 to 300 volts, and normally used at 210 volts at the terminals. The problem was to automatically adjust the furnace voltage independently of the load on the machine, in order to maintain a steady temperature at the specimen. This was done by using an air thermometer in the furnace, and by utilising the corresponding change of curvature of a mercury meniscus to make and break relay circuits. The air was enclosed in a glass or silica vessel, but such a bulb was inadmissible in creep tests on account of cost and probability of breakage when fracture of the specimen occurred. The author tried to adapt the method by using a spirally wound metal tube for the air bulb, but abandoned the idea partly owing to the comparatively large expansion of the metal tube. The generator, being shunt-wound and having a large operating range, was very unsteady, and a small change in load caused a large voltage variation.

The only solution was an automatic voltage regulator on the generator. In view of the cost of the available regulators and the small permissible change in voltage, an attempt was made to devise a regulator to permit a variation of not more than 1 volt in 200 at a reasonable first cost and a low running cost. The mechanism was required to take practically no current and at the same time give a magnified effect. The thermionic valve meets the conditions and gives an indirect regulator.

The sensitiveness of the system depends on the type of valve used, the resistance of the coils and the setting of the relay contacts. The relay at present in use is wound to a resistance of 5,000 ohms, and the valve used is an Osram D.E. 5B, having an impedance of 30,000 ohms. Set with close contacts, the author has been able to use this type of valve, to obtain operation with a variation of 0.3 volt on each side of the normal.

If desired, the line voltage may be maintained by this method within much closer limits by adding a second element, as in fig. 1. In this diagram, AB are the generator terminals shunted by a high resistance potentiometer capable of carrying continuously 200 volts across its terminals. The high-tension battery E is in opposition to the generator, and controls

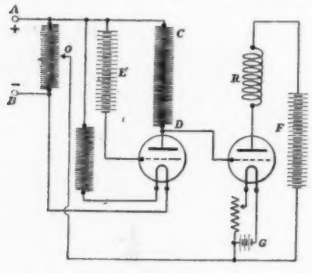


Fig. 1.

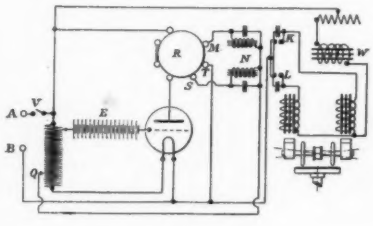


Fig. 2.

the voltage of the set. A suitable high-resistance CD is placed in the plate circuit of the first valve, its value depending on the valve used. The second valve requires a separate filament battery G, as the two filaments are at a difference of potential of approximately 100 volts. The relay operating the mechanical portion of the device is shown at R. A second high-tension supply F is required for the second valve. The potentiometer AOB is necessary to obtain two points O and D at the same, or slightly different, potentials.

With this circuit, the voltage variation has been kept within limits of plus and minus 0.03 volt, but it requires an extra valve with high and low-tension batteries. With a single or double element, operation is extremely rapid, the relay acting on the flicker of the generator voltage. This was not desired in the case in point, as the load was a flickering one, and rapid changes did not affect the testing-machine load; further, it was desired to keep the current through the relay contacts at a minimum. A damped relay was therefore introduced; this was designed so that it would not make a contact until the voltage had been high or low for, say, 30 sec. It consists of an armature on a horizontal shaft, which also carries a contact arm and a paddle in an oil bath. Normally, the paddle is vertical. Movement of the tongue causes the arm to be pulled down on one side or other, and the paddle slowly swings upward. Although only slow movement of the paddle is desired in the middle positions, the change in section of the paddle box permits rapid movement at the extreme angular positions, so that the contacts K L are rapidly made and broken. The contacts are adjustable carbon brushes fixed to the arm, bearing on spring-supported carbons underneath. To reduce sparking at the contacts, condensers are fitted across the gaps, and the arc occurs in a permanent magnetic field.

The complete single-element regulator is shown diagrammatically in fig. 2. The balancing battery E is connected to the potentiometer carrying the filament current. This permits coarse adjustment of the controlled voltage independent of any alteration in the number of cells in the battery. A fine control is obtainable by the screw-adjusted bias of the relay R. The current carried by the tongue and contacts MS operating the relay N, is determined by the position of Q, and, in this case, is limited to 25 mA. The relay N deals with currents of the order of 1 ampere. A subsidiary brush on the rheostat arm makes contact with a split contact ring. Should the arm go past the working limit of the studs, this contact V, is broken, and the regulator shut down. In such a case, it can be arranged that the generator voltage is either fixed at a mean value, or the voltage is dropped to the lowest value possible.

This regulator has been in service in the University Materials Testing Laboratories for the past nine months. During that period, useful experience in the working has been obtained. Roughly, 70 per cent. of the failures have been due to faulty contacts M and S, these having been purposely left without attention for long periods.

By using a Gulstad pattern relay at R, if this carries a current proportional to the load acting in the same direction as the spring, the controlled voltage may be given a rising characteristic to balance the feeder drop. On the other hand, if this winding be excited from an alternating-current or interrupted supply, the tongue may be kept in a state of vibration to overcome any friction at the pivots, and greater reliability be obtained. For medium pressures, regulation within 0.5 volt on each side of the normal is obtainable with a single element and a balancing battery of the same voltage. The same percentage limits can be obtained with a medium-voltage battery and a single-element regulator, by working at a suitable position of the shunt in fig. 2 for any generator pressure. For high supply voltages, a combination of medium balancing battery and a double-element regulator would be more economical for very close regulation.

Transport on the Farm.

(*Discussion on a paper by* Mr. R. BORLASE MATTHEWS *before Section G.—Engineering.*)

This paper was abstracted in our issue of September 9th. The discussion was opened by Dr. ALFRED EKSTROM (Sweden), who referred to his experience of this class of work in Sweden, where there were already over 3,000 farm transporting arrangements on lines similar to those described by the author. As the result of a recent fire, he had had to rebuild a cowhouse entirely, and had installed transport equipment, including electrically-controlled overhead runways and transporters. This had resulted in reducing his already relatively low running costs by about two-thirds without increasing the cost of building. For a farmer the introduction of electric light only would by no means justify the installation of electricity. If, however, electricity was employed also for driving a few motors for such purposes as the pumping of water, chaff-cutting, grinding, milking, separating, corn-crushing and threshing, the electrification of such a farm would be, under all conditions in England, a really profitable matter where a two-part tariff was used. Assuming a charge of 1d. per kWh in addition to the usual fixed charge, the maximum cost on a small farm with a consumption of about 16 kWh per acre worked out at 3d. or 4d. per kWh. A recent article in the ELECTRICAL REVIEW on rural electrification in Denmark had shown that such figures were attained in certain parts of that country, and, in fact, were improved upon in many cases. A total price of from 3d. to 4d. per kWh was quite reasonable for lighting and motive power in smaller units, but, with the increased use of electricity for cooking, water-heating, &c., on a two-part tariff, that price would be reduced considerably. Discussing further the question of improving load factor, he referred to the "Change Circuit" system proposed by Mr. George Wilkinson, which involved the use of thermal storage devices. The Wilkinson system controlled a certain supply of energy from a central station delivering power to a group of consumers, but in a system in vogue in Sweden automatic control was combined with the consumer's meter. If a consumer used electricity for lighting and for sundry labour-saving devices, he paid the ordinary charge. If he wanted storage water heating, however, and used electricity for that purpose only when he was not using it for other purposes, he could pay, for example (on 500 watts), £14 per kW per annum for this load, no matter how many hours he made use of it. The meter was combined with an automatic switch, so that that 500 W was absolutely utilised either for light and labour saving devices or for water-heating. Experience had shown that the 500 W was never used for more than 7,000 hours, so that £14 per kW corresponded to a price of about ½d. per kWh. The system had been at work for several years quite satisfactorily; it could be introduced gradually. Possibly, however, when a certain degree of saturation had been reached, the Wilkinson system would be found to be simpler and cheaper to maintain.

Mr. GEORGE WILKINSON said that experience in Sweden was such that we in this country might with very great advantage take a lesson from it, and follow the lines which Dr. Ekström had indicated.

Mr. BORLASE MATTHEWS, replying to the discussion, said he was gratified to note Dr. Ekström's statement that it paid a farmer to use electricity at 4d. per kWh, because he himself had arrived at that figure independently as being very satisfactory from the farmer's point of view. The average overall cost on the Continent seemed to be about 4d. per kWh. Such systems as the change-circuit, or the Swedish systems would be very important with regard to rural development in the future.

Swedish Electrical Exports.

The *Swedish Economic Review* (the official organ of the Swedish Board of Trade) states that during the first seven months of this year exports of electrical machines were valued at 17,944,000 kr., as compared with 14,731,000 kr. in the corresponding period of 1926. The value of exports of telephone and telegraph apparatus during the same period was 4,636,000 kr., against 3,408,000 kr.

The Shipping and Engineering Exhibition.

A Review of the Exhibits of Electrical Interest.

(Concluded from page 523.)

Electric Vehicles.

The TRANSPORTING MACHINERY & ENGINEERING CO., LTD., exhibited in working condition its "Lizard" electric truck, a recent development which embodies the company's two-motor system and the patent footboard steering gear.

A variety of battery trucks was also seen on the stand of Messrs. RANSOMES, SIMS & JEFFERIES, LTD. The major portion of this exhibit consisted of four types of these vehicles; C11, with a high elevating platform and 2-wheel steering; C4a, with a low elevating platform and 4-wheel steering; a truck with tiering platform, capable of raising loads to a height of 5 ft. 1 in.; and a crane truck fitted with a half-ton swivelling crane for use where heavy loads have to be lifted on to the platform of the truck. A "Ransomes" electric runabout crane was also shown. This is made in five capacities, 7¼, 15, 20, 25, and 30 cwts., and will travel, hoist, derrick and turn about its centre like a turntable under its own power.

Messrs. H. C. SLINGSBY were showing an interesting variety of electric trucks, including load-carrying; elevating platform, for loads up to 2 tons; lifting-tiering, up to 75 in. for loads up to 2 tons; railless tractor-trailer; and industrial engines, railless and for railway trucks.

Fig. 20 depicts a battery locomotive shown on the stand of Messrs. W. GOODYEAR & SONS, LTD., five of which are now in use on the Mersey tunnel contract. It has an average weight of about 45 cwts. and a drawbar pull of 360 lb. at the one-hour rating. The overall width when arranged for a 24-in. gauge is 32 in., and the length 88 in. It is built of steel plating on a frame fully sprung on stout helical springs. The driving motor is of the totally-enclosed series type with series-parallel control. The truck is suitable for equipment with any standard type of battery of 250 to 350 Ah capacity. The operating voltage is 50-60.

Electric Welding Equipment.

In addition to the exhibitors previously referred to, the ALLOY WELDING PROCESSES, LTD., showed a comprehensive range of electric arc-welding equipment. An interesting feature is the "A.W.P." polyphase system, in which each operator uses two electrodes simultaneously. Another new type of machine shown was a multi-operator equipment for three operators, using d.c. at the arc.

The A. C. WELDING CO. showed a variety of different types and sizes of "Alternarc" a.c. cutting and welding machines suitable for any type of arc-welding electrode on the market. These machines are adaptations of what is known as Holslag's transformer, and are noted for the extremely high arc stability factor they give. The design in each case is such that by an interaction between two separate portions of the secondary winding a considerable amount of reactance energy is held in reserve, always ready to overcome high resistance arc fluctuations and maintain the arc.

Miscellaneous Exhibits.

Messrs. AUTOMATIC & ELECTRIC FURNACES, LTD., showed a large range of Wild-Barfield electromagnetic hardening furnaces in operation. Fig. 21 shows a new hardening furnace which has an arched chamber measuring 2 ft. 7 in. by 1 ft. 8 in. by 10 in., and has been specially designed for the correct hardening of large gears. It is fitted with the standard Wild-Barfield magnetic indicator. Another exhibit, fig. 22, is a new carburising furnace, in which the heating elements are totally enclosed in the refractory brick lining of the chamber; all possibility of damage from the soot and gases coming from the carburising compound is thus obviated. The elements consist of spirals of high-quality nickel chromium wire, and run throughout the length of the roof and sides of the furnace, being connected to easily accessible bus-bars at the back, which permits of the easy replacement of the heaters when they have reached the end of their useful life. The furnace is fitted with the company's standard automatic temperature-control gear, consisting of a pyrometer regulator connected to an automatic make-and-break switch. Another piece of apparatus shown was high-speed steel-hardening equipment. This is a complete portable unit for the production hardening of high tungsten steel, and comprises a high-temperature chamber for hardening proper, a preheating chamber, a tray for preliminary warming, and a main switch and fuses, the whole being mounted together on a convenient angle-iron stand to which in addition an optical pyrometer can be fitted if required.

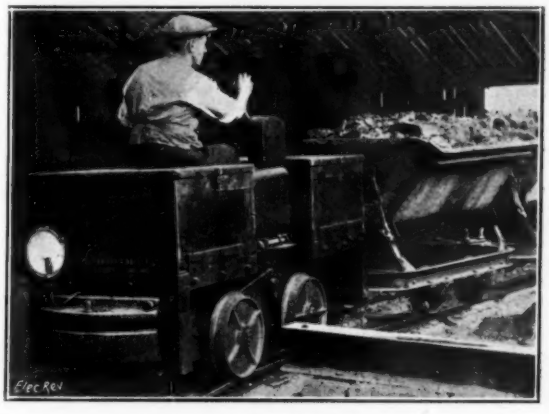
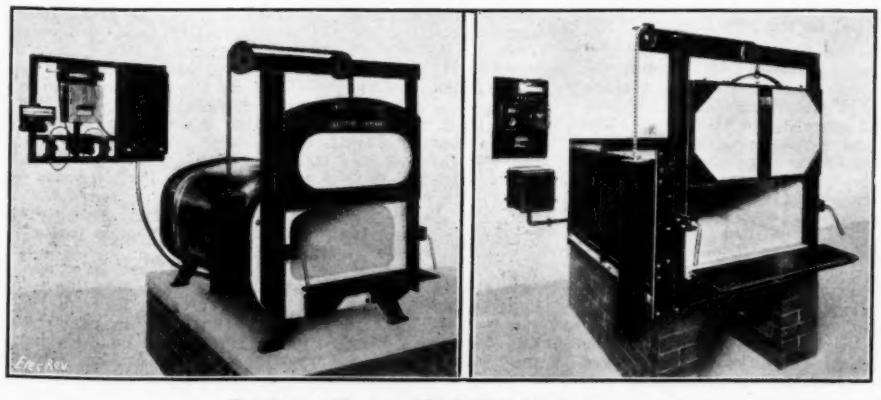


Fig. 20.—An Electric Battery Locomotive.

Among the large variety of tools of all descriptions shown by many of the exhibitors was an interesting outfit, the "Atlanta" drilling jig shown by Messrs. ATALANTA, LTD. This is a simple, but ingenious, device designed for facilitating the drilling of holes diametrically through round stock and spindles of from ¼-in. to ¾-in. diameter. It consists of a pair of blocks arranged with grip vees, horizontal and vertical. The work is held in the horizontal vee; in the vertical vee is placed a "button," centred for drilling, of the same outside diameter as the work. The button is drilled to the required diameter and then acts as a guide to the drill for the hole through the work. Various models of the "Atalanta" screw-driver and chuck were also shown on this stand.



Figs. 21 and 22.—New Wild-Barfield Electric Furnaces.

The TELEPHONE MANUFACTURING CO., LTD., was showing telephone apparatus of varying types. Pride of place was given to the "Laryngaphone," a noise-proof telephone which enables speech to be transmitted and received clearly in the noisiest surroundings. It has been specially developed for use aboard ships between bridge, engine-room, and other positions where noise makes telephoning difficult.

A striking display by the HEWITTIC ELECTRIC CO., LTD., was a range of service-light lamps which give an almost monochromatic light. The lamp units have outputs of from 500 to 1,200 c.p. The life of the tubes runs into many thousands of hours, and the current consumption is ½ W per c.p. The silica lamp was shown in sizes of 2,500 and 3,000 c.p. These have a current consumption of only ¼ W per c.p. Other service-light equipment shown included photographic enlarging and studio lighting outfits.

The RAPID MAGNETTING MACHINE CO., LTD., exhibited different sizes of lifting electromagnets for handling in engineering and shipbuilding works. The firm was also showing various types of electromagnetic separators, some of which were seen operating under working conditions. They included a new high-intensity electromagnetic separator for separating iron and brass swarfe. Separators used in powdered-fuel installations were also shown. The firm's most recent development is a large type "AA" drum, which is now wound to give a very high magnetic intensity.

The exhibit of SIMMS MOTOR UNITS, LTD., included magnetos, magneto couplings, magnetos fitted with impulse starters, automatic advance couplings, flexible couplings for general purposes and petrol gauges. An interesting feature was a form of laminated pole shoe that gives very easy starting and low-speed running. An interesting item was a contact breaker that will withstand speeds up to 10,000 r.p.m.

Included in the exhibits of Messrs. B.E.N. PATENTS, LTD., was a range of portable electric labour-saving tools. Portable electric drills with capacities ranging from ¼ in. up to 29/32 in. in steel were shown; these are suitable for all standard voltages from 95 to 250. Portable electric hand saws capable of ripping or cross cutting timber up to 3¾ in. in thickness were also to be seen on the stand. The depth of cut can be instantly adjusted so that the tool can be used for chasing, grooving, cross-checking, and so on. A portable electric hand planer, mortising machine, and hand hammer were also features of the exhibit, as also were a universal saw and sanding machine, a portable electric sand-papering machine, and portable electric cloth cutters.

On one stand of Messrs. S. G. BROWN, LTD., an attempt had been made to get away from the orthodox exhibition display. There was what may be termed a modern bridge deck. At the fore-end was the bridge, which housed the firm's electrically-operated "Automatic Helmsman," a new 360 deg. course recorder and the new rudder angle recorder. In each wing of the bridge there was installed a bearing repeater compass and electro-megaphones for two-way communication. Abaft the bridge proper was the chart room, over which was mounted the rotatable aerial of a W/T direction finder loaned by the Radio Communication Co., Ltd., whilst inside was the control wheel, adjacent to which was a Brown multiple repeater compass, a master gyro compass, and such auxiliaries as the new type motor-generator and new switchboard and glass cell batteries. The back part of the stand represented the after steering engine house; in it was located the power unit of the automatic helmsman, which was started and stopped by the control unit on the bridge, and which in turn responded to any turning movement given to the master compass.

At the stand of Messrs. GREENWOOD & BATLEY, LTD., was seen a small transmission set consisting of a variable-stroke pump directly coupled to an electric motor, and mounted on a common bedplate. The pump operated a hydraulic motor of fixed stroke, and gave a minimum speed reduction of 3 to 1. The speed could be reduced by any amount down to zero and up to the maximum in the opposite direction by operating the stroke-adjusting mechanism. An interesting feature of this exhibit was a temporary arrangement for illustrating the complete control which can be exercised by an electrically-driven transmission gear for operating a warping capstan. This can be completely stalled without any alteration in the speed of the motor, and the winding speed automatically varies with the load. A compact ship's lighting unit shown by this firm took the form of a 20-h.p. steam turbine-driven dynamo, 110 V. The turbine was a single-impulse wheel, 20,000 r.p.m., with a single-reduction double helical gearing for running the dynamo at 2,000 r.p.m. The turbine can be arranged for exhausting to a condenser, atmosphere, or into a heating system against back pressure. The centrifugal governor operates direct upon a double-beat governor valve, and, in addition, there is an emergency overspeed governor arranged to trip the stop valve. The gearing and high speed bearings are provided with forced lubrication from an oil pump in the bedplate driven by a worm wheel on the geared shaft.

Some interesting items were shown on the stand of Messrs. JAMES GORDON & CO., LTD. They are sole licensees for the Hagan system of automatic regulation for boiler plant, which is designed to "feel the pulse" of the steam in the main range and to move the dampers, vary the speed of the mechanical stokers, and adjust the fan draught to correspond with the demand for steam. The system, which was shown at the Exhibition, is applicable to all types of boilers and stokers, and to pulverised fuel, oil, and gas firing. The Hagan centrifugal steam purifier was also exhibited; this contains no moving parts, but is claimed to remove all moisture from live steam, and both oil and moisture from exhaust steam.

Another feature of the exhibit was the Armstrong thermostatic high-and-low-water alarm and distance indicator; whilst it is actuated by thermostatic tubes, which are fixed outside the boiler, the indications of this device are electrically conveyed to the eye and ear of the attendant, the indicating apparatus being fixed at any desired position and at any distance from the boiler.

The Institution of Public Lighting Engineers.

Annual Conference, at Brighton.

(*Concluded from page 524.*)

B.E.S.A. Street Lighting Specification. Discussion.

OPENING the discussion on this paper, which was abstracted in our last issue, Mr. WATSON said that was one of the first occasions on which gas and electrical interests had been associated in the joint authorship of a paper. He trusted it would not be the only occasion. The early draft specification had been subjected to very helpful criticism and comment from various organisations in the country, and those criticisms and comments had been taken advantage of at later meetings of the Committee. The specification could not claim to be complete, or even final. The complexities of street lighting were great, and the Committee would welcome any expression of views by members of the Institution.

Mr. WALDRAM showed photographs to illustrate the variation of distribution of light in accordance with the condition of the road surface. When the road surface was wet, for instance, there would be bright streaks of light between each lamp and the position occupied at any moment by anyone using the road, and an object in the road outside those streaks of light might be rendered almost invisible.

Mr. J. F. COLQUHOUN (Sheffield) said he appreciated the importance of increasing the height of the lamps above the ground, but there were practical difficulties in the way of increasing it to 13 ft. The cost of the work would be very great, somewhere in the region of 10s. or 15s. per standard. He was prepared to advise his Council to go to that expense, but he wanted a good case to present to it. The question of glare required further consideration, as did also the question of diversity factor, because he was convinced that it was possible to have evenness in illumination carried to such an extent as to make the illumination ineffective.

Mr. HAYDN T. HARRISON, discussing the lack of progress in street lighting, said that Mr. A. P. Trotter, in a paper in 1891, had given certain examples around London where the illumination was 0.005, which was then described as being the lowest possible value one could consider. In the present paper reference was made to cases in which the value of the illumination was still 0.005. In a case in London, the illumination had been reduced from 0.2 to 0.075 between 1913 and 1927. He hoped the specification would help to effect a general improvement.

Mr. E. J. STEWART (Glasgow) stressed the point that the specification had a real mathematical basis. They had now got down to the foot-candle basis for street lighting, and they would all have to buy portable photometers.

Mr. H. S. DOW was anxious that it should not be thought that the shading of lamps was unnecessary, because the softening of light was one of the most important points to be considered. The method given in the specification for assessing glare involved many assumptions. He regretted that it had not been possible to insert a clause with regard to the grading of illumination in order to avoid sudden patches of light and comparative darkness.

Mr. LEON GASTER, referring to the recent International Illumination Commission at Bellagio, said that the street lighting problem was referred back because America had a standpoint different from that of England; in Germany it was somewhere between the two, and so on. He hoped that next year a paper would be brought forward showing what it would cost to convert existing streets from their present standards to the standards which should be attained.

Mr. H. DICKINSON (Liverpool) said the whole subject of street lighting was very intricate, but if the specification did nothing else than to bring about greater uniformity between lighting authorities it would have done a great deal. It should also impress upon lighting authorities all over the country the necessity for spending a great deal more in the future than they had done in the past on the improvement

of street lighting. The raising of the height of the light source was most important.

Mr. E. STROUD (Messrs. Holophane, Ltd.) said the adoption of the specification would have the effect of increasing the height of lamps, decreasing the distance between them, and increasing the illumination at mid-span, thus improving the diversity factor.

The PRESIDENT said the 100 per cent. perfect specification would never come, but they could get near to it. They had something which was good enough to work on, and it was only by putting it into operation that they could improve it.

Mr. WATSON was gratified to find that, generally speaking, those who had taken part in the discussion were in agreement with the specification as a whole. It might be a very good means of inducing lighting authorities to adopt higher grades of illumination and to improve street lighting generally.

Mr. WALDRAM, replying to Mr. Dow, said that in spite of the fact that many assumptions had to be made in assessing glare by the method adopted in the specification, there appeared to be a basis of truth in that method.

Notes on Street Lighting at Brighton.

By JOHN CHRISTIE, M.I.E.E.—(*Abstract.*)

The first section of public lighting in King's Road was officially switched on in 1893; it consisted of some 40 arc lamps run five in series off the 230-V d.c. network. The system was later extended to the eastern front and through the central main thoroughfares. The cast-iron posts are as good as when they were first erected, and by scrapping the old canopy tops and replacing them with suitably designed bracket arms from which modern type lanterns can be depended, we shall be able to re-model this section of our lighting on lines which will compare most favourably with any of the newer types or designs. The less important side streets were also dealt with in turn as the supply mains extended through the central and outlying areas of the town, the old gas lamp standards being gradually converted to electricity, until to-day out of a total of 3,704 public lamps, only 240 gas lamps remain.

After the Armistice was declared the arc-lighting equipment was in a hopeless state of disrepair and carbons were practically unobtainable at any price, so we made shift by fixing 300-watt, 50-volt, metal-filament lamps, five in series, in the old arc-lamp cases, fixing them to slip on the carbon-holder rods and focusing them as nearly as possible central to the 18-in. diameter opalescent globes.

As funds permitted, the lamps for the front and main street lighting were gradually replaced by gasfilled lamps of higher wattage and more up-to-date lanterns, principally of the "Wembley" type. This "series" lighting is not quite so effective as "parallel" 230-volt lamps of the same wattage, but the longer life of the lamp is exceptional, running into an average of over 2,000 hours. Fig. 1 depicts the type of column on the main front, King's Road. When the side-street gas standards were converted to electricity the old square lanterns were re-conditioned in our own workshops and equipped with white-enamelled zinc reflectors with fittings to carry one or two carbons, then metallic filament, and latterly gasfilled lamps (fig. 2). Most of the lanterns on these posts are now beginning to wear out, and we are replacing them with plain swan-neck fittings with enamelled iron reflectors and naked 60- and 100-watt lamps.

In the Valley Gardens, "White Way" lighting with posts and opalescent globes has been adopted for lighting the pathways. This system is most effective, but it could be greatly improved by doubling the wattage and using gasfilled lamps in place of metallic-filament lamps. When we first tried them out with 230-volt gasfilled lamps upside down, we found that the life obtained from the lamps was very short. To overcome this we put a brass spider fitting up the centre of the globe to support three holders; this allows the lamps to hang in a vertical position.

When laying the main for these, the opportunity was taken to group them for sectional switching, so that they can be quickly lighted and extinguished from a very few points. Fig. 3 illustrates this type of lighting unit.

For lighting the refuges in the centre of the town we are now adopting a neat and effective type of fitting designed and manufactured by the Brighton Lighting and Electrical Engineering Co., Ltd.

On account of the good and regular load factor which this class of business affords, the supply undertaking's charges for street lighting should be kept as low as possible. In Brighton we charge 1½d. per kWh, based on the mean lighting hours multiplied by the wattage of the lamps in use, and have no meters. For this we lay and maintain all mains and services for street lighting free of charge, bear all the capital charges in respect thereof, and after meeting these charges this rate only yields us the barest margin of profit.

All lamp renewals, stores, labour for maintenance, cleaning, lighting and extinguishing costs are charged against the District Fund Account at net cost, and the total rate for the lighting works out at the very low figure of 4.5d. in the £.

Discussion.

Mr. H. DICKINSON (Liverpool) said that in Liverpool there were about 120 miles of streets electrically lit, compared with about nine miles four or five years ago. The main arteries of the city had been mostly lit by gas lamps on low standards. The height of the standards was raised, and gas was replaced by electricity; there being a tremendous amount of reconstruction to do, it was thought best to deal with as large an area as possible with the money then available, rather than to go in for elaborate and intensive lighting in a few streets. The aim at present was to increase the candle-power of the lights, which could be done at any time, the wiring being mainly overhead. Little had been done in the side streets, except to improve the gas lighting. New estates, when possible, were being lit by electricity.

Mr. LENNOX (Newcastle Electric Supply Co.) asked Mr. Christie if he had obtained a special lamp for his series lighting or used a standard lamp. Referring to the symmetrical type of reflectors used on the promenade at Brighton, he suggested that economy would be effected if directional-type reflectors were used, say, of the 160-degree, two-way type.

Mr. H. S. Dow (Illuminating Engineering Society) said he was favourably impressed with the lighting along the parade at Brighton, but would prefer the use of diffusing glass globes,

Fig. 1.

Fig. 2.

Fig. 3.

Electric Street-lighting Standards at Brighton.

which not only distributed the light uniformly, but also had a pleasing appearance on handsome columns.

Mr. L. E. BUCKELL (Electric Lamp Manufacturers' Association) said the lighting of Brighton showed the advantage of having the light sources at a minimum of 13 ft. above the ground, for wherever one went there was sufficient light, and even when the roads were wet one did not experience glare.

Mr. S. B. LANGLANDS (Glasgow) said that he had persuaded his Committee to stand a rate of 8d. in the £ for public lighting. One valuable use of good lighting was to attract traffic along particular thoroughfares not generally used to a great extent, when other thoroughfares parallel to them were congested. It had paid him to encourage shopkeepers, by means of a special rate, to keep their lights on until 11 p.m., in that way helping the street lighting.

Mr. R. BIRKETT (Southend-on-Sea), speaking of glare, said it was necessary to educate lighting committees as to what glare was, because it was glare which seemed to impress them! They looked only at the source of light, and not at the ground. Commenting on Mr. Christie's reference to time switches, he

said that in Southend all the lamps, with few exceptions, were lit and extinguished automatically. Relay switches controlled by pilot wires were used, and the arrangement had not failed once during the two years it had been in operation.

Mr. R. DAVISON (Newcastle-on-Tyne) said that he and Mr. Lennox had been considering the overhauling of a district electrically lit, at a cost of about £12,000. He had wondered whether or not to install time switches. He had quite 3,000 gas lamps lit by clockwork, and that halved the wages bill.

Mr. W. M. MASON (British Commercial Gas Association) pointed out that in Brighton the gas supply was in the hands of a company and the electricity supply undertaking was municipally owned. Although Brighton was electrically lit, and, from many points of view, beautifully lit, some of the finest street lighting in this country was gas lighting.

Mr. HAYDN T. HARRISON reminded engineers that when considering changes they had good opportunities for adopting the B.E.S.A. specification, which all agreed, he believed, was a very valuable one. Referring to the replacement, in Brighton, of sheet-glass lanterns by swan-neck fittings having shaped enclosing globes, he pointed out that sheet glass could be made in this country of a standard and reasonable thickness, whereas enclosing globes of any size could be made only in one or two places in this country; they were generally imported, and were unreliable.

Mr. T. G. BRANSFORD (Stepney) said there was a clock on the market having a switch on the outside of the container, so that in cases of emergency, such as fog, the electric lamps could be switched on by hand independently of the clocks.

The PRESIDENT said that, owing to the fact that the liability of failure of street-lighting cables was very much greater than of services to private houses, and that the reliability of the supply to private houses was decreased if one used the same network for both private supplies and street lighting, he had decided to lay a separate network for street lamps. This had not involved any extra cost, and he had not regretted the decision. It enabled the engineer to switch on the whole of the lamps in the borough when he thought fit. Of course, the power was not taken from the power station to all the lamps direct. He had a certain amount of cable to operate the supply from sub-stations, and where there were no pilot cables there was a skittle switch to the last lamp in a series which switched on the current to the next series of lamps. That was found to be very reliable. Also, time switches had been used for many years in isolated parts.

Mr. CHRISTIE, replying to the discussion, said that in Brighton he had found series lighting very satisfactory indeed. With regard to the promenade lighting he intended to submit another design of fitting for the tops of the columns. Replying to Mr. Mason, he said he would not have substituted electricity for gas if he could not have provided better lighting at a lower cost than that provided previously by the Gas Company. He controlled 240 gas lamps, and they cost a substantial amount more, and gave a less satisfactory light, than the 60-watt electric lamps.

Street Lighting and Traffic Problems.

By R. L. MATTHEWS, O.B.E., Chief Constable of Leeds.
(Abstract.)

Upon the initiative of our Lighting Engineer in Leeds, special "Caution" or "Danger" lamps have been fixed at approaches to dangerous corners for the dual purpose of lighting the highway and warning drivers of vehicles of dangerous crossings, &c. These are fixed at points selected conjointly by the Lighting Engineer, the Highways Engineer, and the Chief Constable, and have proved of great assistance.

Various suggestions have been made from time to time on this subject, and I subjoin a summary of these with which I entirely concur: all road surfaces, footways, junctions, and crossings should have an even illumination; there should be no dazzle or glare from "naked" light; shadows should be eliminated as far as possible; uniformity should also be aimed at so far as height and power are concerned, and also with regard to the distance between lights; all danger, direction, destination and village signs should be adequately illuminated; all lighting should be governed on a principle which would give facilities for additional illumination as a set-off against any curtailment of light provided by theatres, shops, and so on; additional lights should also be provided on lamp standards at important crossings and junctions; in several cities and towns tramway traffic is diverted from the line of main road traffic to special tracks on the side of the road, and light at each end should warn drivers of vehicles other than tramcars that the tramway track is diverted.

The best type of street lamp for important thoroughfares is, in my opinion, an overhead light centrally fixed. This illuminates a very large surface and throws no shadow in the centre of the road.

As far as possible lamps should be installed upon a universal system, easily discernible by the travelling public, with a view to eliminating the danger which undoubtedly exists at certain places where lamps are erected along the chief suburban roads.

The modern tendency is to keep shop windows well lighted until late in the evening. The occupier's primary reason for this is with a view to advertising his goods, but it also safeguards his property and affords better facilities to the police for supervision purposes. At the same time it also promotes additional street lighting, and usually during the period when night traffic is at its height. Street illumination should be continued to a limited extent until daybreak.

Discussion.

Mr. ADAMS (Edinburgh) said that at many of the crossings on new roads in Edinburgh there were large circular areas, some of them having a diameter of from 100 to 150 ft. The risk of accident might be considerably lessened by the use of beacon lights, furnished with one red and one green light facing each road. It was no use making arrangements of that kind, however, unless there were uniformity and control by a central body. The Institution of Public Lighting Engineers could give the greatest assistance in drawing up a uniform scheme, and he urged that the Council should bring forward suggestions, place them before the general body of members for examination and criticism, and thereafter submit them to the Ministry of Transport.

Alderman R. TAYLOR (Bolton) said that the shadows cast by some street lamps were a source of anxiety to motorists; he had seen street lamps which cast a "Y" shaped shadow on to the road. The lighting at Bolton had been improved greatly as the result of the Chief Constable calling the attention of the Lighting Committee to the increased motor traffic through the town. The "Veranda" type of lamp, as used in Bolton, did not throw shadows.

COUNCILLOR W. CARRY (Aberdeen) urged that the Lighting and Watch Committees jointly should consider questions relating to traffic control, and that the various lighting authorities should co-operate with a view to obtaining uniformity.

Mr. LEON GASTER (National Safety-First Council) said that only recently the House of Commons had passed the Road Transport Bill, but there was not a word in it about street lighting. It was absolutely essential that this Institution should impress upon the authorities that it was their business to see to it. The ratio of night to day accidents had increased from 29 to 46 per cent.

The PRESIDENT commented on the lack of uniformity throughout the country with regard to traffic signs, which were of different colours, different shapes, and in different positions. It was imperative that before it went too far there should be some co-ordination, and that there should be a standardised system applicable to the whole country. The only way in which that could be done was for all the bodies interested in this matter, such as the National Safety-First Council, the Institution of Public Lighting Engineers, &c., and the Ministry of Transport, to co-operate and form a joint Committee to deal with the matter.

Election of Officers.

Mr. A. C. Cramb (Electrical Engineer and Manager, Croydon) was elected president for the ensuing year, and Mr. J. F. Colquhoun (City Lighting Engineer, Sheffield), vice-president.

Mr. H. Dickinson (Borough Electrical Engineer, Liverpool), was elected to serve as vice-president in succession to Mr. Colquhoun when the latter became president.

Councillor MINSHALL (Chairman of the Lighting Committee, Sheffield) extended a hearty invitation to the Institution to hold its Conference next year at Sheffield, which was accepted.

Exhibition of Street Lighting Appliances.

The importance of public lighting and the advance which is being made in that connection were reflected in the exhibition of street-lighting appliances which was, as usual held this year in connection with the Conference. There was a marked increase in the number of electrical exhibitors and in their exhibits, and some of the interesting features which were to be seen are briefly referred to below.

The chief item on the stand of Messrs. KORTING AND MATHIESEN (late Photector Co., Ltd.) was the safety-first "Throlite" lantern. This gives an intense concentrated light on a tramway crossing or where the policeman may be directing traffic at a busy junction. On the top of the lantern is superimposed the red triangle safety-first sign, two, three or four signs being used according to the requirements. The sign is being employed by the City of Leeds, and is arranged for flashing in accordance with designs by Mr. Shapley, superintendent of lighting of that city. The main distribution light from a height of 45 ft. is by a 500-watt lamp; the triangles are illuminated by 100-watt gasfilled lamps.

The exhibit of the BRITISH THOMSON-HOUSTON CO., LTD., comprised many types of lanterns, pole-top units and brackets, wall brackets, street-lighting pillars, and various gas and water-tight fittings, together with a range of "Mazda" gasfilled lamps. Items of particular interest were the "Kent" and "Leeds" lanterns and the "Rugby" pole-top unit, all recently introduced.

The "Kent" lantern has been developed for general use in street and outside shop lighting, and is constructed in two sizes suitable for "Mazda" gasfilled lamps of from 100 to 500 W. The body consists of a number of sheet-copper spinnings, giving, in conjunction with the fitted globe, a pleasing outline.

The "Rugby" pole top has been specially designed for the illumination of large areas. It consists of a cast-iron spigot socket containing a groove in which the globe rests, a "Nelite" globe of pleasing contour, and a copper-spun cap secured by spring fingers. The globe is slightly opalescent, and is practically self-cleaning in a shower of rain. The standard finish is Admiralty grey.

The "Leeds" lantern, fig. 1, has a distinguished appearance, and is constructed in two sizes suitable for gasfilled lamps of from 100 to 500 W. The unit consists of a canopy made of copper spinnings reinforced with a wrought-iron spider,

Fig. 1.—The "Leeds" Lantern.

and a globe cage consisting of wrought-iron strips attached to a two-part ring. B.T.-H. "Nelite" glass is used; this has a rippled surface to break up the light.

The GENERAL ELECTRIC CO., LTD., displayed a wide range of street-lighting apparatus designed for use with gasfilled lamps. This included Paisley lanterns, Gecoray reflectors of various patterns, a range of Wembley street lighting lanterns, including the new decorative models for esplanades, winter gardens, and so on, and also a series of small suburban models for side streets and residential areas. In addition, the well-known 1,000/1,500-W types of G.E.C. fittings for main-thoroughfare lighting were also exhibited. All the models shown were equipped with the makers' dome refractors. Interesting items on this stand were the new G.E.C. "Urban" and Metropolitan Wembley conversion sets, the former for converting existing electric standards into ornamental units to link up with modern town planning extensions where complete new units are being installed, and the latter for converting existing gas standards to electric. Enamelled steel dispersive reflectors for direct lighting were also featured.

Messrs. VENNER TIME SWITCHES, LTD., had a fairly representative display of their apparatus. This included the type "BF2" time switch, which is claimed to be the smallest 5-A one on the market. It is specially constructed for street-lighting work, and it was shown in a variety of boxes to suit local circumstances and with and without fuses.

A 400-A oil-break switch, type "OE," suitable for controlling a whole district, was shown, as was also the latest Venner product, an electrically-wound clock that requires no attention of any sort except an occasional correction for any small timekeeping errors.

The LONDON ELECTRIC FIRM showed its standard contact and suspension gear for street lighting purposes. One of the makers' span-wire traverse gears was also to be seen. This admits of a lantern being suspended in the centre of the

Fig. 2.—A Long-span Suspension Gear.

road from the span wire, and at the same time of traversing to the side and lowering to the ground for cleaning and maintenance purposes. Fig. 2 shows an installation of suspended lamps which this firm has erected at Hove. One of the spans is 160 ft. long, crossing diagonally the junction of two streets.

The principal exhibits of interest on the stand of the CABLE ACCESSORIES CO., LTD., was a new series called "Industrial" reflector fittings. These have been designed to reflect all the available light flux in the most useful direction, and conform to the B.E.S.A. specification applicable to such fittings. The fittings themselves are soundly constructed. The novel feature of these fittings is an easy wiring device. When erecting the fitting, by simply rotating two knurled screw heads on top of the fitting, the reflector portion lowers down, exposing the lampholder for wiring. There are no loose parts, no screws to take out, and the reflector does not have to be placed on one side in order to allow the workman to use both hands to wire the holder.

Messrs. METRO-VICK SUPPLIES, LTD., made a special feature of their ornamental White-Way lanterns. It is interesting to note that one of the first installations of this type of lantern was carried out in the Pavilion Gardens, Brighton. A sample of the "Brighton" pillar and lantern then used was to be seen on the stand. The residential-street lighting at Paisley is also effected by means of White-Way lanterns,

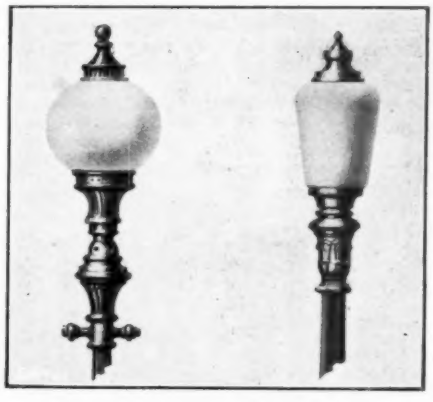


Fig. 3.—The "Paisley" and "Brighton" White-Way Lanterns.

and a sample of the "Paisley" pillar and lantern was also on view. Other features of this display were a range of pole clamp brackets with lanterns of the reflector type, the "Bruce" refractor lantern, and a board showing various types of "Cosmos" products. Fig. 3 shows the Paisley (left) and Brighton (right) fittings.

In addition to a general range of street-lighting brackets, lanterns and switchgear, the ELECTRIC STREET LIGHTING APPARATUS CO. made a special feature of the Croydon type reflectors and the bi-multi reflector. The latter consists of two specially shaped surfaces having many facets or plane sub-surfaces. The main surfaces form part of a single casting forming the housing of the lampholder, which is adjustable so that the power of the lamp used can be increased or reduced at any time. The facets are formed of silvered glass copper plated over the silver, and held into the casting in their accurate optical positions by means of a special hard cement, thus only exposing the casting and glass surface to the action of the weather and forming a solid mass which cannot be easily broken or damaged. Efficiency in street lighting is obtained by concentrating the luminous energy available into the long and narrow area of the street or road.

The principal exhibits of Messrs. FALK, STADELMANN & CO., LTD., were the "Dover" and "Melton" street lighting fittings. The "Dover" lantern is constructed with a stove-enamelled copper casing, to take a gasfilled lamp of up to 500 W capacity; it can be supplied with either an opal or a clear flint globe. The "Melton" lantern combines elegance of outline with sound constructional details. It is made in two sizes; one is 25 in. in length, fitted with an 18-in. diameter reflector, suitable for a 500/1,500-W gasfilled lamp, and the other is 18 in. long, and is fitted with a 14-in. reflector. The smaller one is suitable for a 500-W lamp.

The HORSTMANN GEAR CO., LTD., showed a complete range of its Newbridge electric time switches for public street lighting, including various patterns of ironclad weatherproof cased time switches of from 2.5 A to 50 A capacity, for wall, column and spigot fitting.

A feature of the display by Messrs. HOLOPHANE, LTD., was a series of prismatic refractors illustrating the latest developments in directional street lighting. These are made in several styles to suit the various street-lighting problems. The prisms are specially designed to divert the sideway light to augment the beams required for the actual street lighting, with the result that a large increased intensity is given in those essential directions.

The display by Messrs. SIEMENS ELECTRIC LAMPS & SUPPLIES, LTD., consisted of a selection of specially designed fittings and switchgear for street-lighting purposes, in addition to an array of Siemens electric lamps. A feature of the lamp exhibit was examples of "Silvalux" gasfilled opal lamps, which are claimed to be particularly suitable for street lighting in view of the absence of glare and the better diffusion of light.

Messrs. ENGINEERING & LIGHTING EQUIPMENT CO., LTD., showed a range of ornamental "White-Way" fittings. An interesting feature was the "Trent" fitting. This can be supplied with a prismatic bowl, a clear glass globe, or a band-type refractor. A special feature on this stand was the "Acme" time switch.

Messrs. BARBER & COLMAN, LTD., showed a range of electric flashing beacons for dangerous road positions. These are operated by a small motor-driven mercury flashing switch in the base. Traffic-control signals were also a feature of the apparatus on this stand.

New Electrical Devices, Fittings, and Plant.

Readers are invited to submit particulars of new or improved devices and apparatus for publication in this Section.

A New Fused Switch.

The FOSTER ENGINEERING CO., LTD., of Morden Works, Wimbledon, S.W.19, is introducing a new "fused switch" for all circuits of from 5 to 10 amperes at 250 volts, which is to be called the "Wee Apex." Hitherto circuits of low current capacity, up to 10 amperes, have had to be wired

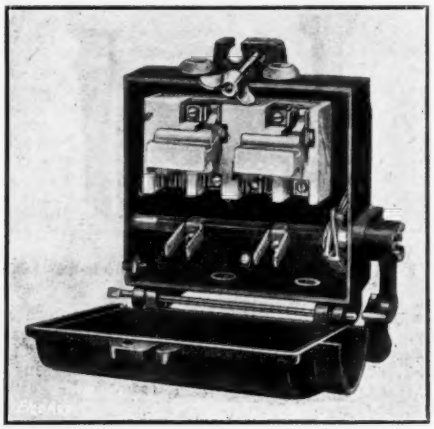


Fig. 1.—The "Wee Apex" "Fused Switch."

with tumbler switches and separate fuses, usually mounted upon a wooden board. There are objections to this arrangement, but the cost of ironclad switchgear was an obstacle to its use. We understand that the "Wee Apex" compares favourably in price with the tumbler switch combination, and it is preferable due to its iron enclosure and robust construction, especially in foreign countries, where climatic and other considerations are of first importance. The "Wee Apex" has been tested by the National Physical Laboratory, under the conditions imposed by the British Standard Specification, which requires a 10-amp. fuse to clear a short circuit of 1,000 amperes on 250 volts without damage; but it must, of course, be understood that the switch is only designed for a maximum working current of 10 amperes on any voltage up to 250 volts. The accompanying illustration, fig. 1, shows the compactness of the switch, its weight being approximately 2¼ lb. and overall dimensions 5 by 4½ by 2¼ inches.

The "Utility" Fixed-charge Collector.

It is hoped that, to a large extent, electricity will displace coal and gas, not only in the households of the well-to-do, but also in those of artisans and other workers. It is found

Fig. 2.—The "Fixed-charge Collector."

that, provided a suitable system of charging is adopted, electricity can be supplied at remarkably low rates per unit for lighting and household purposes. The system mostly favoured in connection with the supply of electric energy to small dwellings consists of the combination of a fixed charge to cover the cost of plant and installation, together with a low charge per kilowatt-hour consumed and registered on a single electricity meter.

The fixed quarterly charge above referred to is frequently based on the ratable value of the premises to be supplied or on the number of lamps and other appliances installed, or on the floor area of the premises, &c. But there is a difficulty in arranging any of these schemes in connection with prepayment consumers. A prepayment consumer pays for his electricity in advance by means of a shilling-in-the-slot meter, and the latter is emptied once a quarter. A prepayment consumer cannot be expected to pay a monthly or quarterly bill to cover the fixed charge, in addition to paying for his electricity by prepayment meter. Hence, prepayment consumers are necessarily excluded from the benefits of a system entailing a quarterly or monthly fixed charge.

ELECTRICAL UTILITIES, LTD., of Tudor Works, Park Royal, London, N.W.10, claims to have succeeded in overcoming this difficulty by developing an instrument by means of which prepayment consumers can be supplied on a fixed-charge system (figs. 2 and 3). The instrument which effects this result is termed the "fixed-charge collector," and consists of prepayment mechanism embodying an electric switch which can only be made to close the electric circuit on the introduction of the predetermined number of shillings, and can only be opened by hand by an authorised person when the prepayment meter and the "fixed-charge collector" are both periodically emptied. By this means the fixed charge is placed on a prepayment basis, and its collection requires no increase of staff.

It will be obvious that the "fixed-charge collector" can be used for other than the above-mentioned purpose. Thus, by employing it in conjunction with current limiters, the current-limiter system is placed on a prepayment basis.

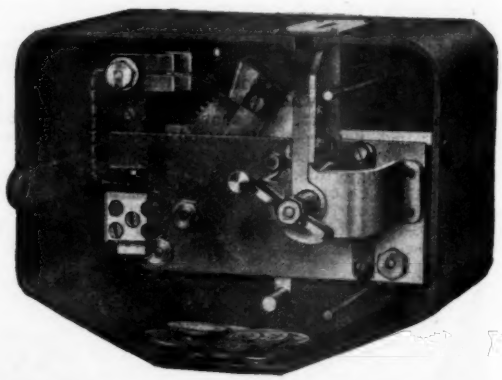


Fig. 3.—Interior of "Fixed-charge Collector."

Alternatively, the "fixed-charge collector" can be used alone without any other instrument where a supply authority wishes only to make and collect a predetermined monthly or quarterly charge for electricity or for free wiring, or for hire-purchase of apparatus and the like.

Type F.C. 2-12 is required where the amount to be collected consists of a number of shillings between 2 and 12, and has the advantage that the consumer can insert the required coins week by week before the collector calls and opens the circuit, thus obviating the necessity of providing the full sum at the end of the quarter.

A Versatile Woodworking Tool.

A recent introduction of MESSRS. B.E.N. PATENTS, LTD., 96-98, Victoria Street, S.W.1, is the improved electrically driven universal saw and sander. This is claimed to be particularly suitable for woodworking. It is equipped with a rising and falling table, tilting to 45 deg., a saw guard, protractor guide, 6-in. general-purpose saw blade, a 6-in. by ½-in. grinding wheel with a tool rest and wheel guard, an 8-in. garnet disk sander, and an endless V-belt drive. When desired the machine can be readily used as a bench polisher by fitting a suitable rag mop in place of the grinding wheel supplied. The driving unit is a ½-h.p. electric motor, either a.c. or d.c., according to specification. The motor and saw speeds are 1,800 and 3,600 r.p.m. respectively. The machine weighs 82 lb. complete.

Notes from Canada.

(From Our Special Correspondent.)

IN the August issue of the *Electragist*—the "Official Journal of the Association of Electragists-International," which emanates from an office in New York City—is an editorial which is of interest to the British manufacturer on account of the following statement:—

"Canada has been importuned time and time again to *lower the bars* so as to permit the use of *standard English-made electrical goods.* While having the deepest love and respect for the mother country, Canadians realise that the people of North America have come to demand a *higher standard.*"

It was surely a "100 per cent. American" who wrote the foregoing effusion.

The editorial is headed "Another Bond," and has reference to the new Canadian Electrical Code which it is expected will be issued very soon now. This Code is evidently hailed in the United States as "another bond" between the two countries, tending no doubt to make Canada, to use ex-President Taft's word, an "adjunct" of the United States. It is gratifying, however, to note that Canadians have their own views on these matters, and do not need United States editors to interpret them to the public. The following extracts from an editorial in the *Electrical News* (Canada) expresses what the writer is convinced are the views of a large majority of electrical men in this country. Referring specifically to the paragraph quoted above from the *Electragist*, the *Electrical News* says:—

"This statement is foolish in its inaccuracy. The inferior goods that have tried to get into Canada did not come from England. Who has ever suggested the lowering of Canadian standards? Who has ever suggested that English goods have failed to meet the requirements of the National Code on account of inferiority? They are different—that's all. Built to a different design—quite as good, and in certain cases better, than that demanded by the National Code.

"It looks as if the writer of this editorial, in his trusting innocence, 'fell' for some plausible conspirator who was interested in creating the impression that recent obstacles placed in the way of marketing British electrical goods in Canada and the United States have been due to the low rating of the equipment, rather than a slavish and illogical adherence to a code that places standardisation before quality.

"The conditions that have brought the Canadian code into being are not such as the editor of the *Electragist* suggests. The prime reason was the desire to be able to utilise in Canada goods made in Canada, the British Empire, or elsewhere, highly desirable on account of their superior quality, but denied National Code approval *for reasons in which Canadians are not interested.*

"We have no doubt that the Canadian Code will be found to be of a sufficiently high standard to meet all criticism, but have no doubt either that it will be flexible enough to recognise quality in the product of any manufacturer who may have an honest article and an honest desire to serve the public. Any code that does more than that defeats its own end."

If the foregoing quotation represents the Canadian attitude correctly, as the writer of these notes believes to be the case, the British manufacturer may take heart and realise that the issuing of the Canadian Electrical Code will be the first step towards the adoption of standards chosen for Canada by Canadians. The second step is already in prospect, the Department of Trade and Commerce having recently announced that a Canadian Government Laboratory will be established—this will mean that electrical goods for Canada will be approved at Ottawa and not in Chicago. The Canadian Electrical Code may, perchance, prove to be—contrary to the fond expectations of the editor of the *Electragist*—"another bond" between Canada and the homeland, instead of between Canada and the United States.

An Aviator-Contractor.

The most up-to-date electrical contractor appears to be Mr. E. Fagan, Jr., of the Fagan Electric Co., Little Rock, Arkansas. According to the *Electragist*, Mr. Fagan is a licensed pilot and pays service calls by means of a small airplane. The tools and equipment are carried in the body of the plane. The company reports that this method of serving its clients has met with success.

Electricity in Mines.

Annual Report of the Chief Inspector of Mines.

THE annual report of the Secretary for Mines and that of the Chief Inspector for the year 1926 were issued recently (H.M. Stationery Office, price 5s. 6d. net). The former points out that owing to the coal dispute, through which half a year's normal output was lost, the usual statistical comparisons are of little practical interest. The quantity of saleable coal raised was 126¼ million tons. The average output of coal per man-shift worked during the first four months of 1926 was nearly 18½ cwt., as compared with 18 cwt. in 1925; since the resumption of work and the lengthening of the working day, the output has increased to 20¾ cwt. per shift. There were 1,084,600 wage-earners on the books at the end of 1925, and 1,111,900 at the end of March, 1926. By the end of the year 952,400 were at work again. The home consumption of coal in 1926 was reduced by one-fourth, as compared with the average for recent years. The price of British house coal reached 55s. to 65s. per ton at pits in the Midlands in October, but had fallen to 35s. in December.

The use of aluminium capsules in electrical detonators in place of copper in coal mines was forbidden in November, 1925, on account of the increased liability to explosion. Seven new types of electric lamps were tested and four were approved.

The Chief Inspector of Mines reports that 228,431 persons were employed at the surface and 899,778 persons underground in coal mines; 649 were killed and 90,862 injured. There were only two fatal accidents underground and one on the surface due to the use of electricity. Out of five explosions of firedamp, one was due to a defective electric cable.

Plant and Equipment.

	England and Wales.	Scotland.	Gt. Britain.
Total mines at work... ...	2,321	519	2,840
Mines at which electrical equipment is installed ...	1,234	343	1,577
Number of electric motors in use	25,775	8,482	34,257
H.p. of motors in use:—			
Below ground—			
Haulage	294,910	61.817	356.727
Conveyors	3,633	4.509	8.142
Pumping	265,804	99,387	365,191
Coal-cutting machines	49,497	41,973	91.470
Other portable machines	2,079	2.072	4,151
Miscellaneous	19,286	7,078	26.364
Total	635,209	216,836	852,045
Above ground—			
Winding	123,171	9 398	132.569
Ventilation	100,139	9,473	109.612
Haulage	63,725	8,158	71.883
Washing or screening	114,605	17,629	132.234
Miscellaneous	301,909	19.893	321.802
Total	703,549	64.551	768,100
Grand total	1,338,758	281,387	1,620,145
Number of mines at which coal-cutting machines were in use	633	265	898
Disk type	425	553	978
Bar	369	398	767
Chain	2,101	544	2,645
Percussive	2,088	34	2,122
Total number driven by electricity	1,668	1,446	3,114
Total number driven by compressed air	3,315	83	3,398
Total number of machines	4,983	1,529	6,512
Total quantity of coal cut (tons)	18,899,087	8,878,803	27,777,890
Percentage of total cut by machines	17	53	22
Number of conveyors at coal face	1,398	269	1,667

Slight increases were recorded in most categories of electrical machines in coal mines, but though the number of mines at work increased from 2,721 in 1925 to 2,840 in 1926, the number of mines at which electrical equipment was installed fell from 1,589 to 1,577. The aggregate horse-power of motors rose from 1,556,235 to 1,620,145. Mines where coal-cutting machines were in use fell from 915 to 898, and the number of electrically-driven machines from 3,134 to 3,114, but compressed-air machines fell from 3,516 to 3,398. On the other hand, the percentage of coal cut by machines rose from 20 to 22, and the number of conveyors at the coal face increased from 1,513 to 1,667.

Flame safety lamps fell in number from 526,916 to 493,325, whilst electric safety lamps rose from 365,823 to 370,123; the vast majority of the latter had magnetic locking.

Electricity was used for firing over 33 million out of 53 million shots, and gave rise to 21,627 out of 33,529 miss-fires.

Eleven non-fatal accidents underground were due to electricity, the same number of persons being injured; and 14 on the surface (all mines), 15 persons being injured. The total number of accidents underground was 82,949, injuring 83,187 persons, and on the surface 8,963, injuring 8,978 persons—total non-fatal accidents (all mines), 91,912.

Correspondence.

Correspondents should forward their communications as early as possible. *No letter can be published unless we have the writer's name and address in our possession.*

The Overhead Lines Club.

Mr. Cramb's strong objection to the creation of any new "body," even a club, to represent a sectional interest, might tempt an outsider to inquire why, and how, it is that the I.M.E.A. exists, when there was, and is, the I.E.E. representing the electricity supply interest. The outsider might be unable to understand how a member of the I.E.E. came to take the position of hon. secretary of a schismatic body which was formed to represent only a part of the electricity supply industry—the municipally-owned section.

The answer Mr. Cramb would give to the outsider is the same as that which he must receive *re* the Club. The larger body represents so many interests that the sectional interest requires special organisation outside the main body, otherwise that interest will be neglected. In other words, the Overhead Lines Club will be to the I.M.E.A. and the Provincial Electric Supply Committee what those bodies are to the I.E.E. The Overhead Lines Club will speak with knowledge, experience, and authority on its special subject, whereas the good intentions of the I.M.E.A., the P.E.S.C., and the I.E.E. are frustrated, due to the handicap under which all "polyglot" bodies labour when dealing with sectional matters.

To give an example of the futilities now existing: The I.M.E.A. appointed a committee which Mr. Cramb thinks is dealing with rural work, but they called it the "*Low* Tension Overhead Lines Joint Committee," when, as a matter of fact, high-pressure lines form nine-tenths of the route for rural work. The I.M.E.A. Council, being "City" men, knew so little of rural conditions, that they thought a few easements in low-pressure regulations would satisfy their country members. No wonder the Electricity Commissioners, being both busy and polite, sent them off to report to the I.E.E.

If the larger bodies wish to justify Mr. Cramb's claim that they can look after our interests, the only way is to get into touch at once with those who are actually trying to do the work of genuine rural electrification and ask them to give evidence before a Joint Committee. The Overhead Lines Club could assist by supplying a list of those whose experience qualifies them to help.

The Electricity Commissioners can do little without a powerful backing, because vested interests are strong. Local authorities, the Post Office, railways, and the official disinclination to alter anything except under great pressure, have to be reckoned with, and wide publicity in both the technical and lay Press is the most powerful weapon.

Fortunately, the Government has made promises of universal electricity supply. Overhead lines in country places will be the cheapest means of convincing the voter of the success of the scheme, so that help may be expected from the highest political circles.

W. Fennell.

Northwich, *September 26th*, 1927.

[This subject is dealt with in our leading columns to-day.—EDS. ELEC. REV.]

Baking with Electricity.

It is a splendid tonic to read your editorial entitled "Baking as an Off-peak Load," which serves to focus the industry upon a profitable and desirable load for supply authorities and a very interesting and remunerative proposition for the keen manufacturer.

Fortunately the former tendency to deal with electric ovens for the baker and confectioner on the same lines as the domestic electric cooker is now discontinued, and a study of the baking trade has resulted in the production of ovens that satisfy the bakery expert in every respect.

Further, with the electric oven we can offer many advantages over the flame-type oven, which to a great extent will offset the adverse working cost. In spite of this, however, we must candidly admit that appreciable progress cannot be obtained until one penny per kWh is the maximum rate for this valuable load.

It is no incentive to be advised by the supply authorities concerned that they can *never* supply a prospective client at a penny per kWh, or by another that they cannot recommend their committee to supply at less than twopence per kWh.

Given a commercially competitive rate, there will be no insuperable difficulty in converting the side-flue oven with its loosely tiled sole lying on sand and the substantial brick crown. The steam-pipe oven is an easier proposition, needing only a suitable heating chamber to replace the furnace, and the blocking-up of the flues. The hot-air oven is equally simple to convert, but what scope has the enthusiast when the powers that be cannot understand that "bread is the staff of life" in more ways than we are accustomed to appreciate?

W. Ellerd-Styles, M.I.E.E.

Leytonstone, *September 20th*, 1927.

Waste in Distribution.

We are 3¼ miles from a large municipal generating station, but, unfortunately, our works is in an urban district adjoining the town. Our local council—not one member of which had any experience of electrical management—instead of handing over its provisional order to the town, which has a very efficient distribution staff with all equipment, decided to buy in bulk and do its own distributing.

To cut a long story short—where the generating town is also doing the distributing in one urban district area, the current is at the same price as in the town, but where a neighbouring urban district buys in bulk and does its own distributing, the price for lighting is 17 per cent. higher, and for heating 40 per cent. higher.

The economies to be gained from super-power stations are small compared with the waste under this parochial method in distributing.

We have complained to the Commissioners, but they say they have no authority to interfere. This seems very strange when we know the powers they possess to close large generating stations.

The Commissioners were appointed to promote cheaper electricity; efficient distribution is as important as efficient generation, and we suggest that they are so obsessed by big generating, that it is *infra dig.* to trouble about the retailing.

Since they have the power to close inefficient generating stations, we think they should also have the power to close inefficient distributing departments.

Economy.

September 20th, 1927.

A Dissentient Voice.

I have just received a circular from the Electrical Association for Women (Manchester Branch) asking for my "support and co-operation" at a conference. This comes at a time when I am trying to support myself by peddling electrical products from door to door! Even as women got into the House of Commons (where they are of doubtful utility) so they will eventually thrust themselves into the electrical profession.

At the present time distress is rampant among electrical engineers, and some, either through age or unemployment, are obliged to take on anything they can get to earn a living. The way the I.E.E. Benevolent Fund is supported tells a tale.

While on this subject I should like to point out how manufacturers "exploit" the unfortunate engineer, many of them, like myself, ex-Service men. They have to pay their office boy and typist, but the agent, traveller, or representative is expected to live "on commission only," and when the firm goes west he is not entitled, under the existing law, to his remuneration in full as are the fortunate employés. Of course, if the "agent" were paid a trifling sum that would keep him in boots and self-respect, that fatuous "rare and refreshing fruit" Act would operate, and the manufacturer would have to contribute. I admit I have a grievance, but I am not going to cut my throat by supporting the admission into an already overcrowded profession of women who would be better employed in other spheres. Perhaps these few lines will deter young men, without private incomes, from wasting their youth in preparing for a career which has proved a tragedy to so many.

Chartered Electrical Engineer.

Manchester,
September 17th, 1927.

[We think that our correspondent is unfair to the E.A.W. The primary object of that Association is to educate women in the uses of electricity in the home. To this end it aims at training women demonstrators in domestic electrical subjects. Only women can thoroughly enter into such demonstrations and make them really convincing. At the same time these women are not "salesmen," and are more of a help than a hindrance to those whose job it is to *sell* appliances.—EDS. ELEC. REV.]

The Problem of the Engineering Executive.

The writer of the short article on "The Problem of the Engineering Executive" in last week's issue of this journal has performed a useful service in drawing attention to a subject that has been too much neglected—the problem of providing a steady supply of the right type of trained men for executive positions in British industry. It is impossible, however, to believe that psychological tests for vocational selection afford the main solution of the difficult problem of finding the right men for leadership in industry. By all means let us employ psychological tests for vocational selection, but as regards the higher positions what is needed is the rigid application of the principle of promotion by merit and much greater concentration on the problems of industrial administration. The question of the selection and training of those who wish to enter industry with a view to the attainment of good executive posts is very important, but not more important than that of enabling those who are at present responsible for the conduct of industry to increase the efficiency of their methods and practice.

As regards the first question, much must depend on what industry has to offer. The average type of entrant attracted

to engineering as a profession, for instance, will in the long run be determined by the average rewards to be obtained from it. Under existing conditions these are deplorable, as is shown by the recent salary census carried out by the Society of Technical Engineers. It is mainly because registration would be calculated to raise the status of the profession that the Society promoted the Engineers' Bill in Parliament. A comprehensive measure of registration would do much to regulate the number and quality of engineering aspirants and would give to the profession a central governing body to attend to such urgent issues as bringing engineering education into closer relation with the kind of training required for efficient industrial administration.

The scientific institutions foster the technical efficiency of the engineering profession, but few of them do anything whatever to help engineers to become more capable executives. In its technical and scientific training this country has reason enough to be proud of its achievements. It is when we come to training for management functions that our failure reveals itself.

But it is not enough to make adequate provision for training the executives of the future. Not only "scientific management" but all that comes under the head of what is now being called "the rationalisation of industry," presents to us an immense field for exploration. The Society of Technical Engineers believes that in this field there is much useful work for it to do, and it is making arrangements accordingly to direct the activities of its members along lines which will enable them to study management problems and make some contribution towards the improvement of current practice and methods.

Management as the third party in industry should have a great part to play in bringing about better conditions and better relations in our industrial life, but it cannot hope to play that part worthily or well until it has equipped itself properly for the task by the earnest and honest study of its own duties and responsibilities.

R. Hazleton,

Secretary, The Society of Technical Engineers.

London, *September 23rd*, 1927.

The E.T.B.I.

My attention has been drawn to certain editorial notes which have appeared recently in one of your contemporaries with regard to the above Institution. In last week's issue they allude to a controversy which has been raging in their columns. After a very careful search I can only find about three letters from correspondents in as many weeks. Possibly the great majority of readers who read their notes feel, as I do, that a little constructive criticism is worth sheaves of the destructive type.

If they are so certain how to organise the E.T.B.I. so as to get the rank and file of the industry (for whose benefit the Institution was founded) really interested, no one would welcome their help more than the hard-worked honorary secretary of the Institution.

What Sir Hugo Hirst said at the last Festival Dinner as to obtaining the interest of the workers in the industry was not new. The subject has been before the Executive Committee for at least two years, and various experiments have been tried. The rules of the Institution have now been altered and revised for the purpose of endeavouring to obtain the worker's support and interest for his own benefit.

All these things, however, take time. One has to remember that all members of the Executive Committee have many calls on their time and energy. Over 150 claims for assistance and grants were made during the last year, each one of which was individually investigated and considered by at least four Committee men and the secretary. Over £1,100 was disbursed, chiefly in weekly grants, to ensure that the largest amount of good should be done.

If one realises that this work alone means many hundreds of different transactions, it will be seen that the work of the secretary and his Committee in this connection is no sinecure.

In conclusion, Sirs, may I say that with your help, the Committee hopes in the near future to launch a campaign to bring home to the electrical industry the needs of the Institution and why it should be supported.

B. A. G.

(*One of the maligned Committee.*)

London, *September 26th*, 1927.

A Two-Rate Meter.

Mr. S. H. Penning expresses his regret that there is no prepayment meter on the English market which can be made to collect the proper charges in a two-part tariff. We are glad to be able to oblige. As it happens, we have developed an instrument to do what is required, and we trust that the "Utility" "Fixed-charge Collector" (patents applied for) will meet the general need.

Electrical Utilities, Ltd.

E. SCHATTNER.

London, *September 23rd*, 1927.

[Some particulars of this instrument are given in our "New Devices" columns to-day.—EDS. ELEC. REV.]

Published Specifications.

Compiled expressly for this journal by a firm of Chartered Patent Agents. The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1926.

10,949. "Balanced protective arrangements for electrical systems." W. J. Brown, A. B. Field, and Metropolitan-Vickers Electrical Co., Ltd. April 26th, 1926. (276,701.)

11,080. "Electromagnetic brakes for rail-borne vehicles." W. Bassler. April 27th, 1926. (276,702.)

11,220. "Thermionic valves." Edison Swan Electric Co., Ltd., L. H. Soundy and T. W. Price. April 28th, 1926. (276,703.)

11,224. "Electric storage batteries." N. Harrison. April 28th, 1926. (276,704.)

11,436. "Automatic telephone systems." Standard Telephones & Cables, Ltd., E. P. G. Wright, and D. H. Wain. April 30th, 1926. (Cognate applications 14,290/26 and 23,420/26.) (276,706.)

11,510. "Sound recorders and reproducers." W. F. Croll. May 1st, 1926. (276,708.)

13,019. "Electric accumulators." J. Tudor. May 21st, 1926. (276,718.)

13,371. "Automatic telephone plants operating with line seekers." E. C. R. Marks (C. Lorenz Akt. Ges.). May 26th, 1926. (276,730.)

13,683. "Cap fittings for electric lamps." W. Dawson. May 31st, 1926. (276,729.)

13,740. "Electrically operated surgical outfits." H. A. Whiteside. May 31st, 1926. (276,731.)

13,957. "Electric fuses." A. Reyrolle & Co., Ltd., B. H. Leeson and R. H. Brierly. June 2nd, 1926. (276,740.)

13,980. "Adjustment devices particularly suitable for use with variable condensers, variometers, and the like instruments." W. J. Davis. June 2nd, 1927. (276,741.)

14,098. "Electric signalling systems." Automatic Telephone Manufacturing Co., Ltd., and C. Remington. June 3rd, 1926. (276,746.)

14,124. "Electropneumatic machines for the recording and checking of statistics and the like." P. Trojani and C. d'Ascanio. June 4th, 1925. (253,134.)

14,194. "Telephone systems." Siemens Bros. & Co., Ltd., and F. P. W. Dumjohn. June 4th, 1926. (276,751.)

14,237. "Automatically oscillating electric fans." Veritys, Ltd., J. F. Lister, and H. W. Smallwood. June 7th, 1926. (276,756.)

14,320. "Electric automatic sub-stations." International General Electric Co., Inc. June 6th, 1925. (253,144.)

14,579. "Adjusting devices for apparatus for telephony and telegraphy." Aktiebolaget Baltic. June 13th, 1925. (253,541.)

14,587. "Alternating current rectifying devices." S. Ruben. June 9th, 1926. (276,759.)

15,219. "Quick make-and-break switches." H. B. Prentice. June 17th, 1926. (276,762.)

15,722. "Automatic electrical power station control apparatus." T. W. Ross, C. Ryder, and Metropolitan-Vickers Electrical Co., Ltd. June 22nd, 1926. (276,770.)

16,263. "Storage batteries." C. H. Everett. April 12th, 1926. (269,122.)

16,444. "Electric switches." British Thomson-Houston Co., Ltd., A. G. Salisbury, and F. A. Fossey. June 30th, 1926. (276,775.)

17,231. "Thermionic valves." M-O Valve Co, Ltd, and T. F. B. Hall. July 9th, 1926. (276,783.)

17,864. "Electrical transformers." Igranic Electric Co., Ltd., and A. H. Curtis. July 16th, 1926. (276,792.)

18,158. "Electric accumulators." K. Nemeth and A. Szanto. July 20th, 1926. (276,797.)

18,813. "Telegraph relays." I. F. Hall and E. H. Sauvage. July 28th, 1926. (276,808.)

19,979. "Electric washing machines." W. H. Wilkinson. August 13th, 1926. (276,818.)

20,660. "Anti-static arrangements in wireless receiving apparatus." A. E. Beattie. August 21st, 1926. (276,821.)

20,883. "Electric furnaces." I. Rennerfelt. August 24th, 1926. (276,823.)

21,521. "Wireless receiving means." A. A. Harrison. September 1st, 1926. (276,830.)

21,586. "Thermionic oscillation generators." H. L. Kirke. September 1st, 1926. (276,832.)

23,849. "Horns for sound-reproducing and like instruments." H. J. Kuchenmeister. December 1st, 1925. (Addition to 259,207.) (262,391.)

24,302. "Selector switches." D. C. Crowe. October 12th, 1925. (259,562.)

26,082. "Wireless telegraphy and telephony." Telefunken Ges. für Drahtlose Telegraphie. October 20th, 1925. (260,259.)

26,426. "Control of continuous electromagnetic interrupters." British Thomson-Houston Co., Ltd. October 22nd, 1925. (260,291.)

26,709. "Electric ship's logs." J. W. Gillie. October 29th, 1926. (276,857.)

29,160. "Vapour electric devices." British Thomson-Houston Co., Ltd. November 18th, 1925. (Addition to 248,396.) (261,763.)

30,768. "Electrical distributing systems." British Thomson-Houston Co., Ltd. December 8th, 1925. (262,767.)

31,030. "Electric inductances and transformers." E. L. Wildy and London Electric Wire Co. & Smiths, Ltd. December 7th, 1926. (276,867.)

1927.

15,427. "Electric power generating plant." Metropolitan-Vickers Electrical Co., Ltd. June 24th, 1926. (273,273.)

15,991. "Dynamo-electric machines for use in connection with radio apparatus." Telefunken Ges. für Drahtlose Telegraphie. June 15th, 1926. (272,932.)

20,082. "Electric cables." Siemens-Schuckertwerke Akt. Ges. July 31st, 1926. (275,250.)

109. "Non-magnetic alloy of high electrical resistance." Y. Kamishima. January 3rd, 1927. (276,874.)

1,832. "Electric lanterns and the like." Soc. des Accumulateurs Electriques (Anciens Etablissements A. Dinin). February 18th, 1926. (266,303.)

1,963. "Relay arrangements for use in telephone or like systems." Siemens & Halske Akt. Ges. April 1st, 1926. (268,733.)

2,169. "Electrical insulation." Dubilier Condenser Co. (1925), Ltd. June 9th, 1926. (272,438.)

2,297. "Dial switches for telephones." Siemens & Halske Akt. Ges. July 26th, 1926. (274,809.)

3,432. "Thermal and electrical insulators." Soc. La Thiolite. February 6th, 1926. (265,625.)

Trade Mark Applications.

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from September 21st:—

Preskite. No. 480,730. Class 8. Insulated electric cables.—British Insulated Cables, Ltd.

Robot. No. 482,361. Class 8. Electric batteries and cells and parts thereof.—Paul Rosenberg, Berlin. (British representatives: Herbert Haddan & Co., 31-32, Bedford Street, Strand, W.C.2.)

Protecsulation. No. 483,132. Class 8. Electric cables.—Greenwich Cable Works, Ltd.

Falva. No. 482,644. Class 50. Insulating preparations.—Pinchin, Johnson and Co., Ltd.

New Work for Contractors.

Particulars of new works and building schemes for the use of electrical installation contractors in search of work and all interested in the sale of electrical and allied plant and other products.

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

ALNWICK.—Laundry, for the Electric Laundry Co.

AYRSHIRE.—Shops, hall, and offices, for Troon Lodge Navigation No. 86, to cost £2,600; the secretary. New shops at Troon, for Co-operative Society, to cost £2,400; the manager.

BARNSLEY.—Abattoir, &c. (£30,000), for the T.C.; borough engineer.

BARROW.—Conversion of Osborne Hall, Michaelson Road, into cinema, for Osborne, Ltd.

BATH.—Church, Bathampton, for the Wesleyan trustees; secretary.

BIDEFORD (Devon).—Fire station, for the T.C.; R. J. Harris, borough surveyor.

BOURNE.—Houses (24), for the U.D.C.; Mr. Unwin, builder, Sheffield.

BOURNEMOUTH.—Regent Cinema (£150,000); Provincial Cinematograph Theatres, Ltd.

BRADFORD.—Housing scheme, Eccleshall (366 houses); city architect.

BRIDLINGTON.—Welfare centre and school clinic, Oxford Street; borough engineer.

BRIGG (Lincs.).—Beet-sugar factory, for Sugar Industries Auxiliaries, Ltd., London.

BYFLEET (Surrey).—Church, for the trustees of Woking Wesleyan Circuit; secretary.

CHATHAM.—Assembly hall and class rooms, St. Joseph's Convent; Mother Superior.

CHERTSEY.—Housing scheme (24), Byfleet, for the R.D.C.; surveyor.

COLCHESTER. — Shopping arcade; George T. Morris, architect.

CROYDON.—Extensions, Central Library (£18,000); borough engineer. Factory, Factory Lane; Risick, Fraser & Co.

DONCASTER.—Block of business premises, Market Place and Scot Lane, for Hastie & Son; T. H. Johnson, architect, Priory Place; Thomson & Dixon, Ltd., builders.

DUDLEY.—Cinema, for the Provincial Cinematograph Theatres, Ltd.

EDINBURGH.—Picture house to seat 2,500 people, to cost £39,000; F. R. Graham-Yool, managing director, Rutland Square Picture House, Ltd.

EVESHAM.—Extensions, Prince Henry's Grammar School; governors.

FENTON (Staffs.).—Electricity for power and lighting City Cabinet Works, China Street; J. Bould.

FRIMLEY.—Extensions to District Cottage Hospital (£13,000); Hospital Committee.

GLASGOW.—Picture house at Knightswood; W. Inglis, architect, 216, Bath Street. Extensions, Bridgeton Hall, London Road; city engineer.

GOLBORNE (Lancs.).—Church and rectory; Rev. J. Clarke.

GOSPORT.—Reorganisation of sewage and refuse disposal plant, with new machinery (£11,770), for the T.C.; borough engineer.

GRIMSBY.—School (£49 848), for the Borough E.C.; Hewins and Goodhand, builders.

HOLYWELL.—Additional 112 houses, for the R.D.C.; surveyor.

HORSHAM.—Extensions, Christ's Hospital (£50,000); M. B. Davie, treasurer.

IRISH FREE STATE (Bray, Co. Wicklow).—Electric wiring 68 houses; E. M. Murphy, town surveyor, Town Hall.

(Carlow).—Church at Carlow Craigue; Foley & O'Sullivan, architects, Grafton Chambers, 102-103, Grafton Street, Dublin.

JOHNSTONE.—New shops for Co-operative Society; the manager.

KIDDERMINSTER.—Re-erection of flour mill, electrically equipped, Mill Street, for J. P. Harvey & Co., Ltd. (several thousand pounds).

KING'S LYNN.—Housing scheme (62), for the T.C.; borough surveyor.

KIRKINTILLOCH.—Important extensions at Southbank Iron Works; the manager.

LIPHOOK (Hants.).—Church; United Methodist trustees.

LLANSAMLET.—Electrical supply, Glamorgan Spelter Works; C. Tennant & Sons, Ltd.

LONDON (Hackney, E.).—Additions, old school buildings, Orchard Street; Bruce Hall Plate Co., Ltd. Buildings, site of 138-140, Stoke Newington Road; A. S. R. Ley.

(Hendon, N.W.).—Fire station and dwellings; U.D.C. surveyor.

(Bermondsey, S.E.).—Hospital, for Bermondsey Medical Mission, Grange Road; H. G. Cherry. Extensions, Central Library, Spa Road; B.C. works manager. Alterations, 116, Tanner Street (£3,000); Wilsons Cooperage Co., Ltd.

(Fulham, S.W.).—Electricity supply, laundry and workshops, Avonmore Road; Messrs. Whiteley's, Ltd.

(West Kensington, S.W.).—Rebuilding railway station, North End Road; Met. District Railway Co.

(Poplar, E.).—80 flats; borough engineer.

(West Ham, E.).—Extensions, Silvertown fire station (£6,750), for the T.C.; borough engineer.

MAIDENHEAD.—Cinema; J. C. Elvy, 3-7, Southampton Street, W.C.2.

MANSFIELD.—Block of shops, for the T.C.; borough surveyor. Greyhound racing track; Wilfred J. Baker, architect, Midland Bank Chambers.

NORTHERN IRELAND (Belfast).—Garage (100 vehicles), for Co-operative Society; the secretary, 20, York Street.

(Londonderry).—Electric lighting for the hospital; Dr. J. N. McLaughlin, acting medical superintendent.

NOTTINGHAM.—Masonic hall and club, Goldsmith Street and Belgrave Square (£60,000); J. Howitt & Sons, Bentinck Buildings, Wheeler Gate, architects.

PLYMOUTH.—Greyhound racing track, Pennycross Peverill, for the Greyhound Racing Association (Plymouth), Ltd.; Sir William Gentle, chairman.

READING.—School, Shinfield Road estate (£11,000), for the borough E.C.; Director of Education.

ROCHFORD (Essex).—Housing scheme (44), for the R.D.C.; A. C. Madge, surveyor, Rayleigh.

ROMFORD.—Church, Mawney estate; W. D. Caroe, architect, London.

ST. ALBANS.—Additional housing scheme (about 130), for the T.C.; city surveyor.

SALFORD.—Cinema, Eccles Old Road and Langworthy Road; borough surveyor.

SEDGEFIELD STATION (Co. Durham).—Saw mill, for T. Thubron & Son.

SHEERNESS.—Additional 65 houses, for the U.D.C.; surveyor.

SLOUGH.—Block of eight shops, High Street, for A. Moss.

SOUTH AFRICA (Cape Town).—Housing scheme (£500,000); city engineer.

STIRLING.—Additional 96 houses, St. Ninians, for the T.C.; Mr. Goudie, burgh surveyor.

STOKE-ON-TRENT.—Hospital, London Road; Board of Guardians. Electricity for lighting, heating, and power at new estate of Sutton trustees, Stoke Lodge; R. Scrivener & Son, architects. 44 houses, Water estate; W. Boot & Sons, Ltd. 2,000 houses; city engineer.

STORNOWAY.—Rebuilding Town Hall after fire, to cost £10,000; Archibald Munro, town clerk.

SWANSEA.—Warehouse, Carmarthen Street; J. O. Watkins.

SWINTON AND PENDLEBURY.—Sewage works extensions, with conversion of pumping system from gas to electricity (£10,000), for the U.D.C.; H. Entwistle, surveyor.

TREDEGAR.—Houses (48), for the U.D.C.; W. Miles & Son, builders, Ebbw Vale.

TUNSTALL.—48 houses, off Greenbank Road; G. Whalley.

WARRINGTON.—Housing scheme (98), Bewsey estate, for the T.C.; A. M. Kerr, borough engineer.

WATFORD.—Market, to be lighted by electricity, for the T.C.; borough surveyor.

WOKING.—Fire station (£4.599), for the U.D.C.; E. & R. Winn & Co., Ltd., builders, 4, Halkin Place, Belgrave Square, S.W.

WORCESTER.—Girls' secondary school (£39,399), for the city E.C.; J. & A. Brazier, Ltd., builders, Bromsgrove.

YARMOUTH (Isle of Wight).—Bank, The Square, for Lloyd's Bank, Ltd.